73 AMATEUR RADIO

International Edition

SEPTEMBER 1990
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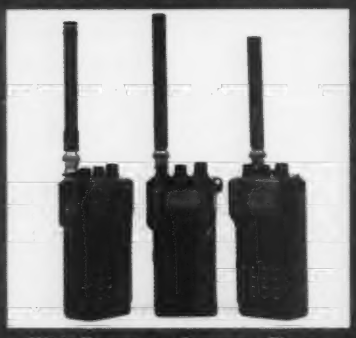

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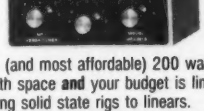

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LETTERS

From the Hamshack

WR8W: I have been a generally inactive ham for 25+ years because hams were . . . well, boring. With retirement I decided to become active. Now I find that some hams are malicious, too. Your editorials are right on. Keep up the good work.

Kevin Thomas, Louisville KY: I hope I'm not the last of a dying breed. I've recently begun taking a course to help me pass the test for my Novice ticket. I've spent the last 6½ weeks steeped in the amateur radio world. Guess what! I am excited about what I see going on. I made the trip to Dayton for the Hamvention. WOW!!! The field is wide open. You are able to go into any field of expertise you wish. At this time I'm actually **excited** about code. It is fun. With a little patience and practice it can be mastered. I'm less than two weeks from test time so I hope that I will soon be among the ranks of the hams.

Rod Templeton, Coquitlam, B.C. After the recent Field Day festivities were over, I felt compelled to write and let you know that some hams still like to introduce new people to the hobby.

I had been trying to find out how to get into ham classes without much success. Then I drove over to the park where the Burnaby ARC had set up for Field Day. I walked around, just having a look for a while, then two gentlemen asked me if I was with the group. I told them I had just come down for a look. One ham, John VE7JPW, actually sat down and asked me what I knew about Field Day and hamming in general. Then he invited me down to the club to see what the meetings were like, and told me about the classes (which always filled up quickly!).

I participated in the contest, helping log stations on 40m for a couple of hours. A lot of people asked me if I was interested in becoming a ham, making sure I knew about the meetings. Everyone I talked to was great. Nobody tried to dazzle anybody with jargon. I'll start classes in October. I'd like to thank the Burnaby Club, especially VE7JKJ, VE7JPW, and VE7MIC for putting up with me while I logged the contest. See you on the air someday.

Phillip Isenberg KB4CPB, Winston-Salem NC: "Everybody" knows what a yagi is. We all understand what is meant by QRT, DX, QSO, RTTY, and packet. But what about the curious person who has heard about "ham" radio and decides to pick up one of our magazines at a newsstand? He or she might as well pick up a foreign newspaper.

Whether the use of jargon and abbreviations is an act of snobbishness on our part or just an unconscious act, most of what we say concerning ham radio goes over the heads of a lot of people. We hear or read "hamspeak" and, like lemmings, we follow along and encourage others to use our jargon, too.

"Hamspeak" annoys and confuses people who would like to learn something about ham radio but are repulsed at every juncture by our incomprehensible and easily misunderstood language. Sure, they can learn the hard way, the way we learned. Pay their dues, earn their stripes, and someday be a ham, too. But for everyone who achieves hamdom this way, 100 or 1000 others listen to our jargon and run the other way.

So who needs them, right?

Do you have all the club members you want? Do you dealers have all the customers you need? Do you magazines have all the subscribers you want and need to stay in business? Chances are the answer to these questions is a resounding "No!"

Unless we clean up our act and go out of our way to help the beginner learn the ropes and give him or her a chance to learn from us without having to master "hamspeak" first, we may someday soon be a very small society of ex-hams.

Bob Kozlarek WA2SQQ, Elmwood Park NJ: We all have some talent or product to offer our fellow hams. I got the idea to compile every modification I could find on the SB-220 and offer it at a modest price. My wife laughed and said, "Who would ever buy it?" I placed ads in all three of the amateur publications and sat back. All of a sudden the letters came—dozens of them. That was four years ago, and I'm still going strong—thanks to *73's* "Barter 'n' Buy" column. I have consistently received the best response from "BNB" as compared to other publications. Don't be afraid, sit up and give your idea a try. Donna DiRusso and the staff at *73* make placing your "BNB" ad child's play.

Ray Kohler W9OBD, Sycamore IL: We worry about the loss of our amateur radio frequencies, which signals the end of ham radio. This is probably the furthest thing from the truth as far as the death knoll for the hobby . . . the end will be caused by the inconsiderate appliance operators who have licenses now. Let me give you an example, which is not a single instance. We have been giving a lot of publicity to SAREX, DOVE, and hams in the space program. This is a very important PR tool as well as a means to get the young people interested in our hobby. The frequencies for the shuttle audio have been published in all the magazines and are general knowledge to any active ham.

On Saturday April 28, 1990, I had a group of people over to listen to shuttle audio. As we listened on 14.295 MHz there was an offending carrier just in the passband. Tuning up just slightly we could hear a QSO going on. About that time another station came on and asked the two hams having the QSO if they would mind moving up a couple of kHz due to the shuttle audio interference. You can guess what happened next.

The gentleman (ham) who asked them to move was very low key and courteous, which took a great deal of patience on his part. The band was not even crowded, but that didn't seem to matter to the two that were in QSO. I didn't get any of the callsigns or I would have sent all concerned a letter, one of thanks, and two to the offending parties to try to wake them up to the fact that their types are killing ham radio with their self-serving attitudes.

I'm one of the first to speak out against specific frequency use, but this (shuttle frequency) is an exception and only happens two or three times a year, and then only for a few days at a time.

What happens to the young folks who hear this in the classroom? Do we want or need new blood to keep the hobby alive???? Would *you* want to join a hobby that shows this kind of attitude? Remember, there is influence and power in numbers. Without these numbers we may not have a vote in our destiny . . .

Vernon Erle Ikeda, Pierrefonds, Quebec: I was really disappointed with the cover of the July issue. It gives people the wrong impression of amateur radio. I thought that the cover belonged on a mercenary magazine, not on the cover of *73*. Otherwise the issue was great, with DFing as the main article. I just might try it out.

The July cover was meant as a tongue-in-cheek look at Foxhunting, hence the Hambo theme. No, you don't need a gun to locate hidden transmitters. In fact, we received a number of positive comments about the cover at the recent Dallas HAMCOM show. Give DFing a try, I think you'll find it to be a great challenge and a lot of fun.—Bill WB8ELK ... I'm sure glad ELK season hasn't started yet!

Terry Coker AA6LG, Cucamonga CA: I recently read in a bulletin on a local packet BBS about a ham not knowing how to deal with an operator he recently discovered was a bootlegger.

This brought to memory a bootlegger I found out about, named Jeff. He was very active on an L.A. repeater. He had great operating technique and was very intelligent and a good conversationalist. It never crossed my mind he might be bogus.

Jeff made claims to us at coffee meets that certain jammers and bootleggers plaguing the repeater were out to get him. He was, after all, the repeater's most active signal direction finder, and claimed to find several jammers.

Jeff threw a dinner at his place for users of the repeater that was well-attended. He went to repeater breakfasts and meets for coffee in the early morning hours. He was considered one of the regulars and a "great guy." He used lots of the equipment at the repeater's Field Day site.

It was not until a few months ago when I ran across the real ham with the callsign Jeff was using that I realized Jeff was a fake. What an eye-opener! A check of the callbook confirmed the situation.

Suddenly Jeff dropped out of sight—I wonder why?

Jeff fingered several good hams as being jammers. He would drop their callsigns at the coffee stops. His nerve still amazes me. He had the intelligence to easily get a license. I think he got a rush knowing he had everyone fooled.

Martha M. Lostrom KA1UUO, Saco ME: Playing the mandolin . . . and aiming for the Tech and General ham licenses. Do these two things to together? Well, I hope so . . .

I just picked up the July issue. Read the letters and your *[Wayne's]* editorial. Then turned to the ads. I'm faxing my order for your super code tapes—if KA1COJ can do it (July "Letters"), then I can too! After all, I just bought a mandolin with the belief that I can learn to play it. I am in the mood to be inspired.

Will it be easier to learn to play the mandolin, or learn the 13 wpm code on Wayne's tapes? Who knows for sure. But I'm betting that the code is going to be easier.

Newport Yachting Center in Rhode Island was looking for some new attraction for the Newport International Powerboat Show September 20–23, and I said, hey, you want a ham booth with amateurs showing off. They said, OK. We'll give you a 10 x 10 booth (tent) with electricity and all the tables and chairs you want, no charge. OK, I said, put "us" on the schedule. I'm on the hunt for "us." Wouldn't a foxhunt in Newport or a 2m demo be great? I'm still stuck on 10m—hence the need to climb the higher mountain and become a General.

Any hams you know of who would love to get a free pass to the boat show, and turn on an electronics-receptive audience, many of whom are keenly interested in marine single-sideband, PLEASE give me a steer.

Heck, the code is a lot easier than the mandolin. You should have your General in a few days—doing about ten minutes a day—if you do it my way!

The mandolin is a great instrument—beats the viola all to hell. Of course, I'm a bluegrass fan, so I hear a lot of good mandolin pick'n. Once you get good at it, try the banjo too—another great instrument.

The boat show sounds great. I'll pass your fax on to Bill and see what he can muster.—Wayne

Dave Rust WA0LKF, Rogersville MO: I enjoyed reading your "Never Say Die" in the June issue, and couldn't agree with you more.

It seems as though our hobby will never be what it once was, due to the advances in technology and different interests for everyone to pursue. Ham radio was at one time a place where a newcomer couldn't help but learn something, due to the very nature of the testing.

While I agree code is like driving down the four-lane highway in a one-horse buggy, I still take pride in knowing after all these years I can recognize my own call on CW. Some of us remember when we improved ham radio around 1966 with the new idea called Incentive Licensing. It was then designed as I recall with the help of the ARRL to bring gigantic new numbers to our ranks. Apparently they didn't show up in the numbers someone expected, as we have been in a recruitment program ever since.

Now here we go again with a new codeless class of license. I have no objection to a codeless class; however, if the entry level licensee can only have voice on 220 MHz up, the newcomer is going to be mighty lonesome. He will probably wish he had taken up basket weaving.

Our hobby has rapidly become, thanks to the memorizing of the answers, a way to determine when the wife will be there with our lunch, tell whether she still loves you, how her day went . . . . I am still taken back when an operator asks another operator to "Come back and give me your personal again, I missed it."

Now, I don't profess to be the perfect operator. I have not stayed current with the state of the art. I have been known to say damn or hell on occasion, but I don't get on the air and ask someone to come by and help me turn my HF rig on, I don't know how, make it in the next thirty minutes if you can, I have to go teach a Novice class here shortly.

It's easy to see that chasing down every old tired CBer and trying to give them a Novice license wasn't the answer. If we are going to improve and preserve our future, I think we need a test that is a test. It does very little good to memorize a few questions, pass an Extra Class test, become the local expert, and tell the world how much you know with a conversation like this: "Boy, Jake, you gotta beautiful signal in here, your'a lighting all my lights here in the old rig, and you're 50 miles away and I'm just receiving you on an 18-inch spike in the back of the old rig." All that time the full scale signal is coming from a repeater running 30 or 40 watts on a 200-foot antenna only five miles away.

I say let's have tests that are practical, one that tests ability, do some soldering, how to set up a station, cut an inverted-V, do some troubleshooting, etc. We have Volunteer Examiner testing practically on a one-on-one basis, so let it be involved as to what the applicant knows and can do. It will certainly be no extra cost to the Fox Charlie Charlie.

We have discovered that you don't improve the quality by lowering the standards. We simply can no longer give away the store and hope it works out.

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Contract: By reading this, you have legally obligated yourself to: 1. Share this magazine (and the subscription card) with a ham friend; 2. Show your radio to a youngster and tell him/her how great amateur radio is; 3. Fill out the reader service card and send it in. You've got thirty days . . . get to work!

NEVER SAY DIE

Wayne Green W2NSD/1

Mortality

When I started *73*, thirty years ago, I gave little thought to the future. If someone had asked if the magazine would be around in thirty years, I'd have probably said sure, if I'm still around.

But with every passing year I'm more and more aware of how easy it is to be blown away. Somehow I've managed to miss getting killed in accidents...have not contracted any of the almost unlimited number of terminal illnesses...no brain tumors or fatal heart attacks. It's like being on a winning streak in gambling, with the dice coming up sevens every day. Yet I know that one day they'll come up box cars or snake eyes.

For 68 I'm weathering reasonably well. The doctors tell me I'm more like someone ten years or more younger. I'm still an active skier and scuba diver and I walk a lot.

But I'm well aware of the other side of the ledger. My body may be doing well, but it's wearing out in many ways. I can't read without my glasses. Much of my hair is gone. My teeth are gone, although that's more due to my poor choice of dentists than aging.

Glasses are a royal pain. It means making sure any shirt I buy has a pocket. It means going back to get 'em if I start off anywhere without 'em. It means having a glasses cloth in my pocket to keep 'em clean. It means snapping a lens back in when one falls out. It means taking 'em off for pictures...partly for vanity, but more because I use automatic darkening glasses and they usually look black in pictures.

My father and his father had plenty of hair, but nooo, I had to take after my mother's father, who went mostly bald when he was in his 20s. Well, at least I made it to my 50s before my hair left. Now I have more hair on my chest than my head. My second wife wanted me to wear a wig to look younger. I tried one for a while, but it looked dumb. And besides, I've never bowed much to peer pressure. That's probably what kept me from ever smoking. I didn't have a big need to have everyone think I was cool.

The teeth are a real serious nuisance. Last winter I had four posts implanted in my lower jaw. It's supposed to take about six months for the bone to grow around them, so sometime soon the dentist will be cutting my gums open and plugging a lower plate into the posts. I'm sure looking forward to that. More pain.

The up side is that I won't be in agony every time I eat. Right now my lower plate keeps my gums raw from the abrasion...and every time I eat anything hard like nuts or chips, the sharp pieces migrate immediately under the teeth and hurt like hell.

Then there's my ears. They're doing fairly well. At least I'm not hard of hearing like my father and his father. But I do have tinitus...a ringing on the ears...probably a reminder of standing near the 12" guns on a heavy cruiser during gunnery practice...or perhaps of high decibel demonstrating hi-fi speakers at audio shows back in the '50s.

Then there's that pain in my left foot, a reminder of when I broke a small bone while I was in the Navy...which wasn't set right. The Navy doctor was a ham, naturally, so I've had a slight limp and pains ever since. The bright side was that I got a lousy 10% disability payment for a few years.

More serious was a close call with cancer of the colon a couple years ago. That was a near miss where my doctor claimed my laptop computer saved my life.

A few years back I developed high blood pressure. My doctor prescribed Dyazide for it and my blood pressure went down to normal just fine. The side effects are uncomfortable though. Like a constant post nasal drip which has given me a sore throat for the last several years and made it so I can no longer sing. And a swollen gland behind my left ear which makes it painful to wear my glasses. And a dizziness when I wake up...I almost fall down now and then. And frequent cramps in my toes and legs. And the darndest bruising I've ever seen. When the dentist did my implants my whole jaw turned purple. He said he'd never seen anything like it. I banged the calf of my leg while diving and my whole leg turned purple for weeks.

Oh yes, Dyazide also seems to cause gout. I experienced intense pain in both big toes after being on my feet for four days at a business show, so the doc put me on Benamid to stop it. Heaven knows what side effects I'm getting from the Benamid.

It seems to me that this tendency to bruise easily is indicative of weakened blood vessels and that probably means I'm a good candidate for a stroke. My mother's mother stroked...as did her mother.

My father died at 87 from smoking...emphysema and a weak heart. My mother (also at 87) from Alzheimer's. You can bet I'm watching for any signs of short-term memory loss. If I see any signs of that I'll apply for my Silent Key certificate, move right along to the next world and skip the years of misery.

My father's father died of suicide when he got fed up with his bitchy third wife and my Uncle George got him into a stupid business deal which wiped out his life's savings. It was probably a good decision.

I've had a pretty good life. Oh, I've had some world class traumas ...most of 'em involved my first wife ...and a few my second. I've accomplished a lot...more than most people do. But I've still got a lot of goals which I'm uniquely equipped to tackle.

Like getting the ARRL to get amateur radio growing again so America will at least have a chance at recovering our electronic industries. And revamping our lousy American educational system. And writing a book on how the mind works and how to fix it. And building sales for independent record companies. And getting more people to enjoy more kinds of music. Things like that.

It's fun. Sherry and I were recently in Sedalia (MO) for a ragtime music festival. Sedalia is where Scott Joplin got ragtime music started. We were at a Scott Joplin Club reception and sitting at a table with two men. One turned out to be a fan of *CD Review* and my editorials in that magazine. The other was an old Wayne Green fan from my computer magazine editorial days. Be quiet, my hungry ego.

Other pains. My left hand has been giving me trouble. It started a few weeks ago with an occasional sharp shooting pain when I'd pick something up with it. Then one day it hurt terribly to pick up even a book or open a door. My middle two fingers ache much of the time now, but the sharp pains have subsided.

Then there's an ache in my left leg. Not a strong one, but enough to let me know that something isn't working just right.

Looking at it pragmatically I've got probably ten years left to harangue you...twenty tops. Heck, I've already outlived most of my critics. I'll be 68 on September 3rd, marking my 52nd year of hamming.

I started *73* thirty years ago because I believed it was needed. It's here today for the same reason. It's been fun helping make things happen...like NBFM, RTTY, SSB, SSTV, repeaters, cellular radio, computers, compact discs ...stuff like that. I've particularly enjoyed encouraging thousands of readers to become entrepreneurs and make money. Lotsa money.

It's been fun starting new publications and other associated businesses. I've tried to make it possible for young, untrained people to come to work for me and build their skills. Some have gone on to be very successful. A few are still with me. Several for over ten years.

There's always something new going on. We've just started a 900 number so my *CD Review* readers can call in (at their expense) and let me know what they think. They can also check out the music we've reviewed. And there's my anti-longbox campaign, my recent discovery and marketing of balonium, our Astounding Sounds 2000-mile caravan tour, a couple of new publications, more record releases...and let's see, what was that about a possible diving expedition to the Galapagos? But first I have to get my mail answered...and there are editorials for around 20 publications to write. Sigh.

The Ham Market

Maybe you've noticed that the ham magazines are thinner today than they used to be. Maybe you noticed that *Ham Radio* magazine blew away recently. Maybe you've heard rumors that another ham rag may be in trouble. If you have noticed these things, maybe you've wondered. Maybe not.

Near's I can figure, today's ham market is running about 25% of what it was 25 years ago, when the ARRL dropped their Incentive Licensing bomb on their members. We had a rushette when two meters got repeaterized twenty years ago, building ham sales to about double today's ham market for a short while. But it cooled off again.

Old-timers will remember when we had a dozen or so large companies making ham equipment. Like Swan, Gonset, B&W, Collins, Hallicrafters, Hammarlund, National, Central Electronics, Lakeshore, Harvey-Wells, Galaxy, Clegg, and Drake. Heath is still with us, but I've heard they may finally be giving up on the ham market.

So what's our future look like? Are we going to see fewer and fewer manufacturers as we old-timers die and our hobby shrinks? There *is* an alternative, but only if you swing into action.

Yes, of course every one of us should take some responsibility for our hobby. We should be out there Elmering youngsters, starting radio clubs in our schools, and sending PR releases to our local newspapers. But hey, that's a lot of work for old-timers like us. If we had any youngsters we could leave the job to them, but we cut off our youngster input 25 years ago, so we don't got 'em any more.

What *can* we do? Throw the rascals out of the ARRL who've made or allowed this to happen. Take aim at the League fall elections and don't re-elect even one of the present directors. Ban Old League Directors...a BOLD move.

You've got to move fast to oust those who come up for re-election this fall. You've got more time to round up some hams who are more interested in our hobby and its survival than they are in the incredible prestige and perks of being a director. If you start now with this project in your radio club, by next year we could have the first real election of directors in the history of the League.

The platform I'd look for in a director would be a pledge to have the League set up two new departments, each with a staff and a budget. One would be dedicated to cleaning up our bands. The other to rebuilding our ranks. Are those goals out of line for our only national organization? Those should be their first responsibilities, not their last.

One of my business axioms is almost worth thinking about. I know it's heresy in America today and it harks back to kinder, gentler times, but here it is: "The customer may not always be totally wrong."

Are you, as a ham, satisfied with the League's performance in resolving repeater problems, the 14,313 mess, net jamming, bad language, DX pileups and such? Are you a completely happy customer as a League member?

Are you satisfied that millions of American kids have never even heard of our fantastic hobby? Has the loss of some two million engineers, technicians and scientists which amateur radio would have contributed, had it con-

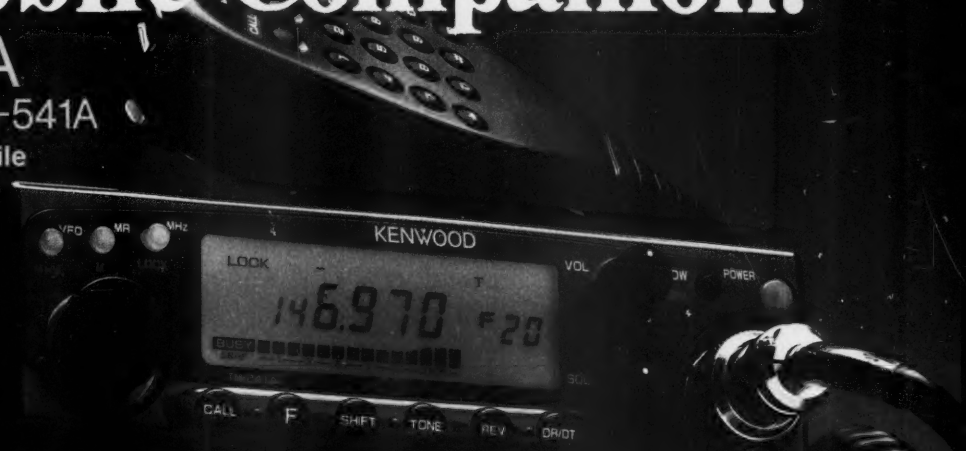
continued on p. 76

KENWOOD

Mobile Companion!

TM-241A
TM-441A/TM-541A

Compact FM Mobile transceivers



Here are your new mobile companions — at your service whenever you're on the road! Their compact size makes installation a snap, and the remote control options allow you to customize your installation for that "professional" look!

- **Wide band receiver coverage.** The TM-241A receives from 118–173.995 MHz. Transmit range is 144–148 MHz. (Modifiable for MARS and CAP operation, permits required.)
- **TM-441A** covers 438–449.995 MHz, and the **TM-531A** covers 1240–1299.995 MHz.
- **CTCSS encode built-in, selectable from the front panel.**
- **Selectable frequency steps** for quick and easy QSY.
- **TM-241A provides 50 W. TM-441A 35 W, and TM-541A 10 W.** Three power positions, 5, 10, and full. The TM-541A has two power positions, 1 and 10 watts.
- **20 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2m is automatically selected.** There are **four channels** for "odd split" operation.
- **Tone Alert System with Elapsing Time indicator.**
- **Auto-power off function, and time-out timer.**

RC-20 Remote Control Unit
As supplied, one RC-20 will control two transceivers. **Most often-used front panel functions** are controllable from the RC-20. The RC-20 and IF-20 combine to allow control of up to four radios.

- **Selective calling and pager option.** The DTU-2 option enables the Dual Tone Squelch System (DTSS), allowing selective calling and paging using standard DTMF tones.
- **Digital recording system option.** Used in conjunction with the tone alert system, the DRU-1 allows message storage of up to 32 seconds.
- **Multiple scanning functions.** Band and memory scan, with selectable scan stops and memory channel lock-out.
- **Large LCD display with four-step dimmer control.**
- **Automatic Lock Tuning (ALT) for the TM-541A.** Compensates for drift.

- **Supplied accessories.** Mounting bracket, DC cable, fuses, MC-44DM multi-function DTMF mic.

Optional accessories

- **DRU-1** Digital Recording Unit
- **DTU-2** DTSS unit • **IF-20** Interface unit, used with the RC-20, allows more than two transceivers to be remotely controlled • **MA-700** 2m/70cm dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mounting bracket • **MC-44** Multi-function hand microphone • **MC-55** (8-pin) Mobile mic. with time-out timer • **MC-60A, MC-80, MC-85** Base station mics. • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **PG-4G** Extra control cable • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **PS-50/PS-430** DC power supplies • **RC-10** Handset remote controller • **RC-20** Remote control head • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **TSU-6** Programmable CTCSS decoder

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Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and features are subject to change without notice or obligation.
Specifications guaranteed for Amateur band use only.

KENWOOD

TS-950SD

"DX-clusive" HF Transceiver

The Ultimate Signal.

The new TS-950SD is the first Amateur Radio transceiver to utilize Digital Signal Processing (DSP), a high voltage final amplifier, dual fluorescent tube digital display and digital meter with a peak-hold function.

- **Dual Frequency Receive Function.** The TS-950SD can receive two frequencies simultaneously.
- **New! Digital AF filter.** Synchronized with SSB IF slope tuning, the digital AF filter provides sharp characteristics for optimum filter response.
- **New high voltage final amplifier.** 50 V power transistors in the 150-watt final section, resulting in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.
- **New! Built-in microprocessor controlled automatic antenna tuner.**
- **Outstanding general coverage receiver performance and sensitivity.** Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides incredible performance from 100 kHz to 30 MHz. The intermodulation dynamic range is 105 dB.
- **Famous Kenwood interference reduction circuits.** SSB Slope Tuning, CW VBT (Variable Bandwidth Tuning), CW AF tune, IF notch filter, dual-mode noise blanker with level control, 4-step RF attenuator (10, 20, or 30 dB), switchable AGC circuit, and all-mode squelch.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features and prices subject to change without notice or obligation.

DSP is a state-of-the-art technique that maximizes your transmitted RF energy

- **High performance IF filters built-in†** Select various filter combinations from the front panel. For CW, 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!
- ***Multi-Drive Band Pass Filter* (BPF) circuitry.** Fifteen band pass filters are available in the front end to enhance performance.

- **Built-in TCXO for the highest stability.†**
- **Built-in electronic keyer circuit.**
- **100 memory channels.** Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.
- **Digital bar meter.**

Additional Features: • Built-in interface for computer control • Programmable tone encoder • Built-in heavy duty AC power supply and speaker •Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

Optional Accessories
- DSP-10 Digital Signal Processor *
- SO-2 TCXO* • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF*
- YG-455C-1 500 Hz CW filter for 455 kHz IF*
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF*
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF*
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)

* Built-in for the TS-950SD
† Optional for the TS-950S

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Four Balloons Launched!

On July 4 the Amateur Radio Experimenters group in Greenville, South Carolina, launched a balloon carrying several radio experiments from a site just east of Greenville. The group has been working with the Roper Mountain Science Center to involve the local school kids in amateur radio, and a number of the kids attended the launch.

The K4SAO/N4LTA payload consisted of three transmitters: 144.34 MHz FM with a voice ID (100 mW), 145.935 MHz CW (10 mW), and 50.086 MHz CW relaying temperature telemetry. At the top altitude of 94,000 feet, the signals were heard over 350 miles away in Ohio by WB8URI in Columbus and WB8YIF in Little Hocking. Stations in North and South Carolina, Georgia, and Tennessee also heard the transmissions. They believe the package splashed down 35 miles to the west in Lake Toxaway. It was not recovered.

On July 7, two separate balloons went up in separate locations. Mike Bogard KDØFW launched an ATV transmitter with a live color TV camera from east of Kansas City, Missouri. In addition he had a 144.34 MHz FM transmitter with digitized voice ID and a 52.525 MHz FM beacon. Stations as far away as Champaign, Illinois, received the signals (350 miles). After attaining 85,000 feet, it parachuted back to land 18 miles northeast of the launch site. The package was recovered in short order by the many participating foxhunt teams.

Bill WB8ELK launched a microballoon from *73* headquarters that same morning from Hancock, New Hampshire. The 1 milliwatt transmitter on 145.947 MHz sent out altitude telemetry via a Morse code altimeter. Even with the extremely low power level, the signal was heard over most of New England with reception as far away as Ottawa, Canada (280 miles). A small sounding-balloon was used to achieve a 30,000 feet altitude. After the balloon burst, the package parachuted down and disappeared in the Boston area. Meanwhile, near the Boston Harbor lighthouse . . . Mike Cox was very surprised to see a package attached to a bright orange parachute descend from the sky and splash into the ocean just 30 feet in front of his boat. Thinking that millions of dollars had just fallen from the heavens, he eagerly fished the balloon payload out of the water (the Catch of the Day). Although somewhat concerned when the package started beeping at him, he decided not to throw it back and instead gave us a call. Not quite a million bucks, but he did receive a $50 reward!

The K4BV Sky Beacon 1 flight occurred on July 15 from the Daytona Beach, Florida, area. The well-attended HF net on 7.155 MHz was run just like a NASA space launch complete with updates from their Mission Control at the launch site. The payload consisted of an ATV transmitter on 434 MHz and a 1-watt, 2-meter FM beacon on 144.34 MHz, sending down a tone sequence indicating altitude, in/out temperatures, and battery voltage. Unfortunately, a small hole developed in the balloon just before liftoff which caused it to rip apart at 2600 feet. After a brief five-minute flight, the payload landed in woods 2.5 miles away and was recovered by the chase team. At least now the chase team has a successful recovery to their credit. They plan another flight to 100,000 feet in about six weeks.

More on Spread Spectrum

In 1940 Hedwig Kiesler patented an anti-jamming radio and gave it to the US government as her contribution to the war effort. Three years earlier, in 1937, she had fled Austria out of her dislike for the Nazis and Hitler.

She believed the frequency hopping technology she had thought up would keep radio controlled torpedoes from being intercepted or jammed. The technology was simple: A seemingly random series of radio signals, hopping from frequency to frequency at split-second intervals, would be picked up by a snychronized receiver. But the government didn't see the value of the technology and didn't use it in World War II.

In 1957 Sylvania independently developed the same concept, and in 1962 spread spectrum was used during the blockade of Cuba. Now it's the principal means of ensuring secure military communications. Kiesler's patent expired without her ever receiving a cent in royalties.

Hedwig Kiesler, whose stage as an actress was Hedy Lamarr, developed spread spectrum with George Antheil, an American composer. Antheil, who credits the idea solely to Lamarr, refined the snychronization scheme based on the operation of a player piano. The number of frequencies proposed in the patent—88—matches the number of keys on the piano, and specifies the use of slotted piano rolls to synchronize the jumps in frequency in the transmitter and receiver. TNX *Squelch Tales* and *Forbes*.

Soviet QSOs and QSLing

Due to a personal interest in improving the quality of his QSOs with Soviet hams and enhancing US-Soviet relations, W6HJK has compiled a 20-page syllabus of Russian words and phrases for QSOs. He includes suggestions for addressing mail, and a 90-minute audio cassette to help with pronunciation. For more information, contact Russian Phrases for Amateur Radio, Len Traubman W6HJK, 1448 Cedarwood Drive, San Mateo CA 94403. Tel. (415) 574–8303. FAX (415) 573–1217.

In late 1988 a new world opened for Soviet amateur radio operators, when they received permission to send and receive QSL cards direct. In last February's issue of the Soviet magazine **Radio**, as translated by Dexter Anderson W4KM, G. Chilyants UY5XE advises Soviet hams on "how to make use of the right to give one's personal address over the air": "Give your address only when asked to do so by the other station, or after he has given you his; avoid giving your address when working DX stations and expeditions, as your information won't be noted in the log anyhow." In addition: "It's not ethical to indicate the need for IRCs, much less the number of IRCs needed. These things will be determined by the other station. If there are no enclosures in the envelope sent to you, send your QSL via the bureau; if one IRC is enclosed, send your QSL by direct surface mail; if two IRCs are enclosed, send your QSL by direct airmail." TNX *The Parking Ticket* and *The ARRL Letter*.

New from Great Britain

Now there's a magazine for fans of classic, old-time radio— *Radio Bygones*. It caters to the many hams "who wish to preserve and propagate the real glories of older wireless equipment." Recently, many people have realized that these older tube sets are real pieces of furniture. They're also extremely efficient and reliable. Older tube transmitters and receivers are now collectables, getting high prices in private sales and antique shows.

A few of the main features from the June/July issue include "Radio & TV Interference Work in the 1950s," "The First Airborne Radio Telephony," "Wireless Set No. 38," "The Vintage Wireless Museum," and "Coast Radio Stations—the First Sixty Years".

Last June *Radio Bygones* celebrated its first anniversary. For subscription information, write Geoff Arnold G3GSR, *Radio Bygones*, 8A Corfe View Road, Corfe Mullen, Wimborne, Dorset BH21 3LZ, England. TNX *Richard Q. Marris G2BZQ*.

More Ham Astronauts

Four astronauts with ham tickets will be flying on STS-37, still scheduled for this November, Rich Ensign announced at the Dallas HamCom 3 Convention last June. Both the mission commander and the YL astronaut on board have joined the ranks of amateur radio operators. The ham astronauts on STS-37 are Ken Cameron KB5AWP (now a General Class operator), Jay Apt N5QWL, Linda Godwin, and Steve Nagle. Congratulations to the crew of STS-37!

The hydrogen leak on the *Columbia* has been fixed. The earliest possible launch date for STS-35 could be in late August or mid-September, according to the information we have at the time of this writing in late July. TNX *Nashua ARC Bulletin* and *Gil Carmen WA5NOM at JSC*.

AEA's IsoLoop™ HF ANTENNA

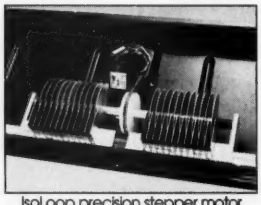
REVOLUTIONARY COMPACT DESIGN

Once again AEA has achieved a significant engineering breakthrough with its high-performance, low profile HF IsoLoop antenna. Performance isn't compromised by its small size. Operate your favorite HF band (14 to 30 MHz frequency coverage) from areas with restrictive zoning ordinances or apartments and condos. Or take it with you on vacation. . . it's the ideal go-anywhere portable antenna. And it's the only antenna you need to cover 14 to 30 MHz. ONE antenna instead of numerous dipoles and without any traps!

150 Watts. Rated up to 150 watts, the IsoLoop transmits and receives on any frequency between 14 to 30 MHz. When mounted with the loop in the horizontal plane, the radiation pattern is omni-directional and horizontally polarized, with the gain of a dipole. Maximum radiation is at low angles which is ideal for DX operation. The IsoLoop may also be mounted with the loop in the vertical plane to provide a null in a desired direction. Tuning is provided by a precision stepper-motor and a small remote control box, the LC-1.

The IsoLoop does not need ground radials and its balanced, shielded feed-loop isolates the feedline from the antenna. The IsoLoop is well-isolated from the feedline. Like AEA's Isopole antennas, your signal is radiated by the antenna and not the feedline. With end-fed antennas, the outside of the coax becomes part of the antenna, resulting in noise and computer hash pickup and increased TVI problems.

High-Q Design. One of the unique features of the IsoLoop is its inherent High-Q. The IsoLoop can be considered a very sharp tunable filter that radiates. The narrow bandwidth suppresses harmonics from your transmitter reducing TVI problems. It also attenuates out-of-band signals from nearby transmitters that could overload your receiver.



IsoLoop precision stepper motor provides accurate tuning.

Compact. The IsoLoop is square, with rounded corners, and measures 32 inches on a side and weighs only 12 pounds. Because of the IsoLoop's small size, it makes a perfect attic or balcony antenna. It's also excellent for portable operation, recreational vehicles or camp-site use. A rotator is not necessary when used in the omni-directional, horizontally polarized mode.

IsoLoop LC-1 control box with variable speed tuning.

Revolutionary. The AEA IsoLoop antenna represents years of research and development. Others may try to imitate the IsoLoop, but none can match the patent-pending design.

AEA also provides technical support from the factory or through your personal computer and modem on CompuServe's HamNet. If you are already a CompuServe member, just type GO HAMNET at any CompuServe prompt. For a free introductory CompuServe membership, call 1-800-848-8199 and ask for representative #48.

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Stand optional.

CIRCLE 65 ON READER SERVICE CARD

Quick and Easy Field-Strength Meter

Home-brewing can be simple!

by Ray Kent KM4KT

I am one of a dying breed—someone who can be found in the wee hours of the morning, hunkered down over the test bench, letting out expletives when the smoke test actually results in copious clouds of acrid smoke. You may be part of this breed, or you may be one of the new breed that spends those late hours staring at a CRT, glued to a keyboard while chasing that elusive bug in your latest program. Whatever your chosen specialty, sooner or later you are going to want some device or gadget that you either can't find or can't afford. The latter is my biggest problem. Prices these days are ridiculous!

The only thing that concerns me more than the high cost of radio today is the lack of growth of appliance operators. I'm amazed that there aren't more technical discussions among the younger operators. Doesn't anyone build his or her own antenna anymore? The smell of hot solder and rosin has an almost hypnotic effect on me, or so my XYL says. Just thinking about taking some of the contents of one of my junk boxes and building some useful piece of equipment gets my blood to racing. I can't seem to get nearly as excited about cutting the grass or taking out the garbage. Crafting something with your hands is a head trip all its own. I'm not talking about a kit, I'm talking about rolling your own project. So dig out that soldering iron, find out where your XYL hid your long-nosed pliers and get ready to have some fun like you did before you got too busy with the other things in life.

Dig down in the bottom of your closet and find that old junk box. If you don't have one, don't worry. All the parts needed can be found at your local Radio Shack, or even at a local repair shop. Most repair shops will help you out in a bind. Remember that a resistor is a resistor is a resistor. A ¼-watt one is specified on the "Parts List," but a ½-watt, or even a 1-watt one will work just fine. The box for the meter can be a new plastic one or almost anything you have on hand. I once built an FSM for a friend that was put in one of those plastic eggs that women's pantyhose comes in. Use your imagination.

Before you say it, I already know that you can buy a commercially-built FSM for under $20. Chicken feed, right? The whole point to this exercise is to get you to build something for yourself that you can use, and to demonstrate how easy home-brewing can be. Call it a confidence builder, if you want. I don't care. I want you to enjoy getting back to the basics and having fun. That's what a hobby is for. Right?

Photo A. The completed FSM.

The circuit in Figure 1 shows how simple the FSM is to build. RF is coupled to D1 and D2, which are configured as a voltage doubler. The developed voltage is seen across the resistors R1 and R2. R2 is the sensitivity control. Simple? You bet. So let's get started.

Parts List

2	0.001 µF 50 volt cer disc cap
2	1N34A germanium diodes
1	¼-watt composition resistor, 4.7kΩ
1	Potentiometer, 10k Ω
1	Binding post
1	100 µA meter movement
	Plastic box, perf board, hookup wire, etc.

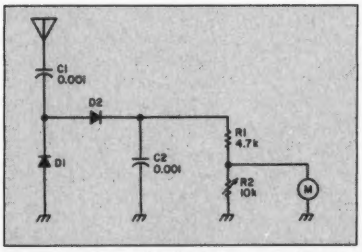

Figure 1. Circuit for the field-strength meter.

Putting the FSM Together

The most expensive part of the whole project is the meter movement. I got mine from Delta Electronics in Atlanta a few years back. Any value of meter from 50 µA to 1 mA will work. The diodes D1 and D2 are general purpose germanium point contact diodes. 1N34As or 1N60s would be just fine. C1 and C2 are 50-volt ceramic disc capacitors. I got mine in a grab bag at a hamfest. R1 is ¼ watt and R2 is a 10k ohm pot from my junk box. I used a 2″ x 3″ x 1½″ plastic box from whereabouts unknown. The size of the box will be determined by the size of the meter that you use.

I mounted all the components on a small piece of perfboard, then mounted the perfboard to the three solder lugs on the potentiometer R2. Next, mount the potentiometer in the hole cut for it in the box. Then connect the binding post to C1 with a small length of hookup wire and connect the meter to the board. That's about all there is to it. Use your imagination to work out your own component mounting schemes. A word of caution: Don't forget to heat-sink the diodes' leads during soldering. Excessive heat can ruin them.

If you want to go to the extra trouble of making a printed circuit board, go ahead. Personally, I thought it was too much trouble for this particular project.

Testing the Meter

Testing is as simple as building the FSM. Just connect a short piece of stiff wire to the binding post and rotate the sensitivity control as you apply a signal to your antenna. It is a good idea to always start with the control all the way to the left to keep the needle from slamming into the stops. While the FSM only gives an indication of relative field strength, it will allow you to check for front-to-back ratio of beam antennas and to make a comparative analysis of different antennas. Get back into building and have fun.

73 Review

by Joe Holman KA7LDN and Garth Hitchens KG7GA

The IsoLoop™ HF Antenna

Small, efficient and portable.

Advanced Electronic Applications, Inc.
PO Box 2160
2006-196th Street
Lynnwood WA 98036-0918
Tel. (206) 775–7373
Price Class: $350

If you enjoy portable HF operation, need an antenna that can be quickly set up for emergency situations, or just plain live in an apartment or tight space that doesn't allow large antennas, AEA might have the answer for you. Their IsoLoop antenna is a 32-inch-square tuned loop antenna designed to operate from 14 MHz to 30 MHz. It's compact enough to be placed in small areas, such as your attic or your outside deck. We operated with the antenna in an attic, bedroom, radio room, on top of a building, on a deck, and on the ground (mounted on a 6-foot mast).

You can mount the IsoLoop either vertically or horizontally. We had good results working DX from the Seattle area when the IsoLoop in the antenna was mounted in the horizontal plane. We worked New Zealand, Argentina, the USSR, and many other countries. When the IsoLoop was mounted in the vertical plane we worked Japan, Australia, the UK, and other countries. The radiation characteristics of the antenna are quite different between the two orientations.

Documentation

AEA provides a 16-page manual with the IsoLoop. The manual begins with a description of the features, theory of operation, and the specifications of the antenna.

Most of the manual is dedicated to assembling, mounting, and tuning the antenna. It includes three separate diagrams that are drawn very well and labeled so that any amateur can identify the parts.

The manual also provides four radiation field patterns corresponding to how you have the antenna mounted. One shows the radiation pattern if the antenna is mounted vertically; the latter three show radiation patterns if the antenna is mounted horizontally at half-wave length, quarter-wave length, or close to the ground. At the end of the manual there is a schematic diagram and a parts pictorial of the LC-1, plus the wire pinouts for the LC-1 Loop Controller.

Quality of Construction

The overall construction of the IsoLoop is very good. The aluminum section of the antenna consists of about ¾-inch aluminum tubing which is very strong and durable. The motor section of the antenna is encased in a plastic shield that gives great protection from the rain.

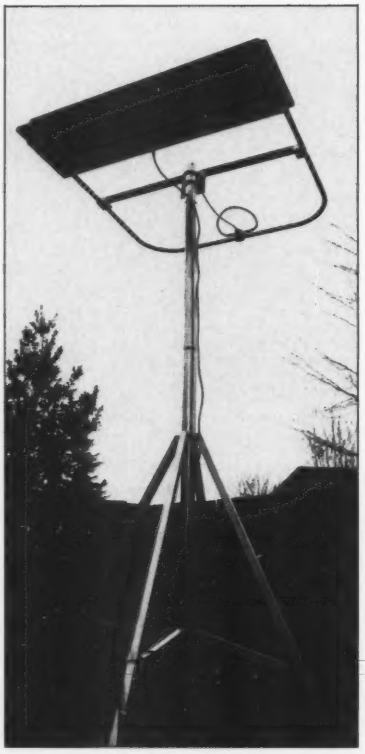

Photo A. The IsoLoop.

The two sides of the rain shield are attached with 14 snap rivets. The snap rivets can be removed very easily in case you need to take the rain shield off to examine the motor mechanism. Also, the rain shield has a couple of small holes in the bottom to drain out any accumulated moisture.

The two separate sections of the antenna are held in place by two couplers which tighten down on the aluminum tubing. In between the couplers, a bar is placed for mounting the antenna on a tripod. The bar is made of wood encased by Fiberglas™.

The Fiberglas seems to be the weakest part of the construction of the antenna. We noticed some minor cracking near the couplers after we tightened them to the bar, even though we were relatively careful to follow the instructions against over-tightening. Because the Fiberglas covers a wood core, the structural integrity of the antenna is not affected.

Theory of Operation

A very popular myth of amateur radio antenna theory states that "bigger is better," and that small antennas cannot ever hope to approach the performance of a full-sized antenna. Proponents of this myth sometimes cite reasoning such as "the capture area is smaller," and therefore a smaller antenna "captures" less signal. The flaws in this reasoning are not particularly obvious and are well beyond the scope of this review. For now, let it suffice to say that the efficiency of an antenna is not dependent upon its size, but upon its losses.

A full-sized resonant antenna (dipole or vertical) has a "radiation resistance" of about 50–75 ohms. Any power dissipated by this resistance is radiated as a signal. Because the resistance of the antenna conductors (loss resistance) is usually very low, often below 1 ohm, a full-sized antenna is very efficient. Most of the power is dissipated by the radiation resistance (as signal) and very little is lost to the resistance in the antenna conductors.

When an antenna is considerably shortened, the radiation resistance drops dramatically and the feed impedance becomes capacitive. To match such an antenna to a 50 ohm transmitter, a series inductor (commonly known as a "loading coil") is required to tune out the capacitance of the shortened antenna. Because a significantly shortened antenna has a much lower radiation resistance, the losses of the loading coil become very significant and the antenna's efficiency is reduced dramatically.

The IsoLoop takes a very different approach to solving this problem. A shortened loop also has a very low radiation resistance, but its feed impedance is inductive. By forming a parallel resonant circuit with a tunable low-loss capacitor, and minimizing any and all resistive losses, it is possible to

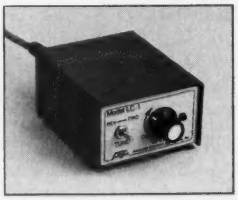

Photo B. The LC-1 control box.

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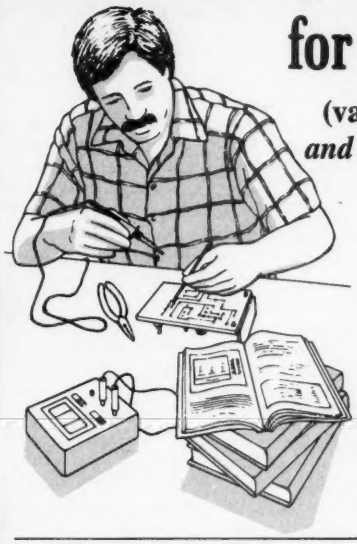

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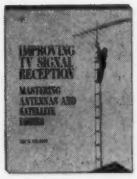

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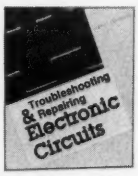

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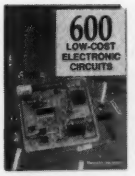

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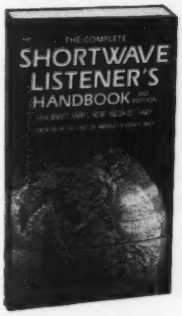

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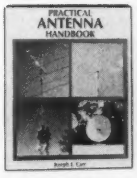

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get very high efficiencies. Small transmitting loops have been around for quite a while, having been used by the army for portable operation in Southeast Asia. Ted Hart W5QJR describes the more recent versions in *The ARRL Antenna Book*.

What is new about the IsoLoop is that AEA has used patented techniques to reduce loss without resorting to expensive techniques such as vacuum variable capacitors. This has made the IsoLoop remarkably cost effective.

Mounting

The IsoLoop is primarily designed to be mounted in a horizontal configuration. This provides an omnidirectional radiation pattern with maximum radiation aimed at relatively low angles for good DX performance.

When mounted horizontally, the vertical radiation pattern of the IsoLoop is affected by its height above ground. When it is very close to the ground, maximum radiation is concentrated around 30 degrees. As the antenna is raised, the lobe becomes lower, down to 20 degrees at a quarter-wavelength above ground, and around 13 degrees at a half-wavelength. Like a dipole, the higher the antenna is mounted, the lower the angle of radiation and the better the DX performance. Radiation from the horizontally mounted IsoLoop is horizontally polarized.

The IsoLoop can also be mounted vertically. This provides a completely different characteristic, easily visualized as a vertical doughnut oriented in the plane of the loop (radiation at all vertical angles in the plane of the loop). Nulls in the pattern exist at low radiation angles perpendicular to the plane of the loop, corresponding to the "hole" in the doughnut.

Vertical orientation can be useful for two reasons. First, the "holes" in the pattern can be used to null-out interfering stations. Second, at low heights above ground, better performance at low radiation angles may be obtained. The radiation is vertically polarized in this position.

In either configuration, special attention must be paid to the "dressing" of the feedline and control cable. These must be routed as directly as possible toward the center of the loop, where they are fed through the mast. If this is not done, antenna performance will be affected, and large amounts of RF can be induced onto the cabling, causing feed-line radiation and a "hot" radio chassis.

When the IsoLoop is correctly assembled and installed, closely following the directions and cautions in the manual, feedline radiation is basically nonexistent.

Usage

The tuning of the IsoLoop is remotely controlled by the LC-1 Loop Controller. (See Photo B.) The LC-1 controls a stepper motor which is coupled to the large air-dielectric tuning capacitor mounted in the antenna, allowing the loop to be tuned for any frequency in the 14–30 MHz range.

AEA supplies a 50 foot shielded control cable which connects between the remote tuning box and the IsoLoop (a 100′ control cable is available as an option). A small AC adapter (included, domestic only) powers the LC-1.

The LC-1 has two controls: a dual-position momentary contact toggle switch, which selects either forward or backward tuning, and a dial which sets the tuning speed. To tune to a particular portion of the band, turn the speed control to full speed, and push the tuning switch in either direction, then wait for a noise peak in the receiver. After hearing the noise peak (up to about 15 seconds, depending on where you were previously tuned), slow the tuning speed down, and use the forward/reverse switch to manipulate the noise peak until it is the loudest. After maximizing the noise peak, you sometimes need to retune the antenna slightly in order to get SWR down to 1.5:1 or less while transmitting.

Once tuned, the loop is usable over a fairly small bandwidth (from about 15 to 75 kHz, depending on the band) before the SWR gets high enough (2:1) that retuning is necessary. At this point, retuning is easier. Simply click the tuning switch in the appropriate direction to move the stepper motor one or two steps while watching the SWR. Generally, it takes 20 to 30 seconds to tune the IsoLoop to be usable on a different band, and 5 to 10 seconds to tune it to a different portion of the same band.

Tuning the LC-1 Loop Controller can be tricky if you don't read the documentation. The documentation gives good instructions on how to control the speed of the controller and how to get your SWR as low as possible.

Performance Test Set-Up

We compared the performance of the AEA IsoLoop against a Cushcraft R5 half-wave vertical (all bands) and a full-sized attic dipole on 10 and 20 meters. The R5 was chosen as it covers the same set of bands as the IsoLoop, is in (roughly) the same price range, and has a similar radiation pattern. AEA's literature makes comparisons with a dipole, and suggests the attic as a possible mounting place for their antenna, making an attic dipole a natural comparison antenna as well.

Most of the tests against the R5 were done using tripods and temporary masts on the flat roof of an industrial building on a hill. We performed tests against the attic dipole in an attic relatively free of metal structures—wood framed with cedar shingles—and on dry days to minimize the effects of a damp roof. The R5 was present at these tests as well, being ground-mounted outside the house.

We also tested the IsoLoop in various other locations, including a sun deck about 10 feet off of the ground, on a mast on the ground, and on the roof of a house. The loop was also tested in both the vertical and horizontal configurations in many of these locations.

The transceivers used for testing included a Yaesu FT-767GX, an ICOM IC-741, and a Ten-Tec Omni-V. Cabling for most tests was through Belden RG-213/U or Belden 9913.

Table 1. Specifications

Frequency coverage	14 to 30 MHz
Nominal impedance	50 ohms
Power rating	150 watts
VSWR	< 1.4:1 (no nearby objects)
Temperature range	0 to 50 degrees Celsius operating −50 to 60 degrees Celsius storage
Dimensions	32 inches square
Max. mast diameter	1¼ inches
Shipping weight	12 pounds
Coax connector	UHF (SO-239)
Gain	Approximately that of a dipole
LC-1 power	12 VDC (adapter included, North America only)
Ant. tuner required?	No
Warranty	90 days, requires receipt

Initial Results

We worked a number of stations on 10, 15 and 20 meters on a variety of days, both DX and stateside. On 20 and 10 meters the IsoLoop was consistently 3–4 S-units below the R5, and 2–3 S-units below the attic dipole, both on receive and transmit. Fifteen meter comparisons showed slightly better performance, narrowing the gap between the antennas one S-unit or so.

This didn't seem right so we contacted Mike Lamb of AEA. He told us that we likely had a problem with the connection of the two halves of the antenna. Following his instructions, we used emery cloth to clean the ends of the aluminum tubing, then firmly tightened the couplers which connect them.

The difference was dramatic. The antenna was now generally on a par with our reference antennas. As it turned out, the poor connection between the two antenna halves had introduced enough resistance to cause a lot of power loss in the connection. AEA has updated the manual to include instructions on how to circumvent this problem.

More Test Results

Once we had the IsoLoop working correctly we again performed a series of tests. With the IsoLoop mounted horizontally, 34 feet above ground, the signal strengths (both received and reported) on average were approximately equal to the attic dipole on 10 and 20 meters, with both antennas at similar heights. In some cases one antenna or the other would have an edge, likely depending on the angle of radiation required to make the contact.

Comparing the antenna with the R5 gave similar results. In general, the ground-mounted R5 had a very slight edge in signal strength, but it was more susceptible to noise pickup. Signals from low angles were generally within 1 S-unit on the meter when comparing the two.

Under ideal conditions, with both antennas a half-wavelength above ground and no surrounding structures, the antenna appears to average within one sixth of an S-unit (1 dB) of a dipole on 10 meters, and within half an S-unit (3 dB) or so on 20 meters. Neither of these differences are easily readable on an S-meter, and the IsoLoop has less noise pickup.

When mounted vertically, the IsoLoop seemed much less dependent upon mounting height, and performed rather well even when mounted only several feet above the ground.

When mounted at a half-wavelength above ground, however, the DX performance was noticeably better in the horizontal orientation.

Noise Rejection

One interesting characteristic of the IsoLoop is that for signals received equally on the reference antennas and the IsoLoop, the background noise was generally lower on the IsoLoop.

On the roof of the industrial building, a number of signals that were hard to copy on the R5 vertical because of industrial RFI were very easily copied on the IsoLoop. This was likely due to the horizontal polarization of the IsoLoop's radiation pattern, combined with the tight bandpass which helps prevent receiver front-end overload by out of band QRM.

Even when compared to a horizontal antenna, the geometry of the loop seems less likely to be susceptible to atmospheric noise pickup than a dipole. Although this results in a signal-to-noise improvement in receiving, it of course has no effect on the transmitted signal.

Things We Liked

SIZE: The IsoLoop is only about 32 inches on a side, and square. This is the smallest HF antenna we've ever used, and it fits easily in most attics, although one must be careful to keep it in the clear and out of the range of (two to three feet away from) nearby conductive objects which will detune it.

PORTABILITY: The antenna is very easy to set up and take down. It only took us 10 minutes or so to install the antenna on a temporary mast and tripod on a flat rooftop.

NOISE REJECTION: The tight bandpass of the IsoLoop effectively improves the front-end selectivity of the receiver. The loop design and horizontal polarization seem to help filter out local QRM under many conditions.

Things We Didn't Like

RETUNING: No matter how you cut it, having to retune the antenna frequently as you tune across a band is tedious. If you tune while transmitting to get a good SWR reading, you are wasting spectrum space and possibly causing QRM.

POWER HANDLING: This antenna only handles 150 watts. Don't expect to use it with a linear—you would fry the air-dielectric variable capacitor.

We believe you will be pleasantly surprised, as we were, with the operating characteristics of the IsoLoop. Overall, we found that the IsoLoop performs quite comparably to a dipole or vertical. We definitely recommend it to any amateur who needs a small or portable antenna. 73

Joe Holman KA7LDN and Garth Hitchens KG7GA can be contacted at P.O. Box 37, Redmond WA 98073-0037.

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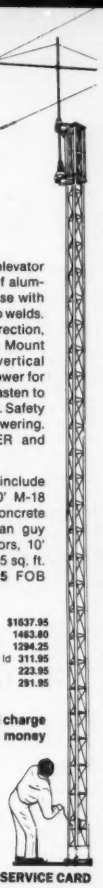

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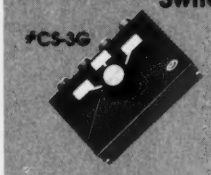

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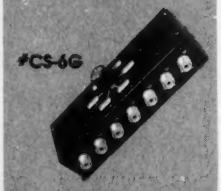

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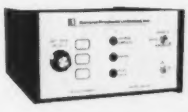
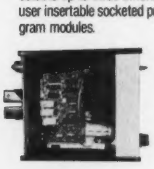
- Front panel Rotary Switch selects up to three different user insertable socketed program modules.



GMS 403
(3 Program Slots)



GMS 403
(Top Inside View)

- Full **THREE** Year Warranty.
- Proven 8 Year Old Design.
- Front panel Status Indicator alerts operator if Nicad capacity is low.
- Rapid but cool charge cycle.
- Automatic Shutoff — never overcharges batteries.

*** NEW PRODUCT ***

Same as our time proven GMS 403 except it can accommodate up to 14 different program modules.

ATTENTION GMS 403 OWNERS
If you own a GMS 403, it can easily be user upgraded to a GMS 403A by ordering our Module Extension Kit.

GMS 403A
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DR-590T(NEW)

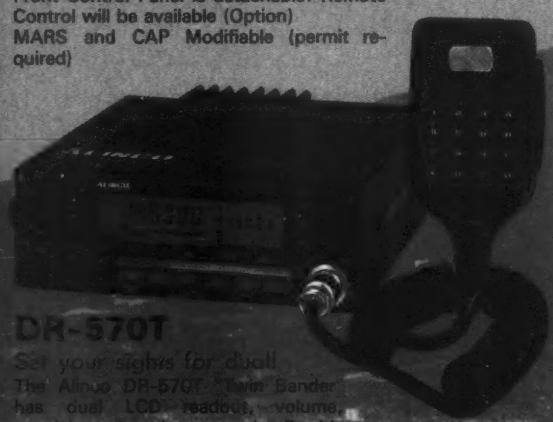
VHF/UHF Twin Band Mobile

144-147. 995Mhz(RX137—173. 995Mhz)
440-449. 995Mhz(RX410—469. 995Mhz)
45W Hi, 10W Mid., 5W Low on VHF
35W Hi, 8W Mid., 5W Low on UHF
Cross Band Repeater Function Simultaneous Receiving and Scanning on both Band
Front Control Panel is detachable. Remote Control will be available (Option)
MARS and CAP Modifiable (permit required)

DR-110T & DR-410T

Tiny 2M Power From Alinco!

DR-110T, this 2M Alinco, enters the nineties a proven winner with the "reputation" of best value. The DR-110T packs a powerful 45W on 2M and sports all the features you expect in todays transceivers. Tuning is a snap with the multi-functioned easy-to-see keyboard, 14 memory channels, subtones, scan, multi-colored LCD readout, reverse, are a few of the many features of the DR-110T. The mobile of the future-today! DR-410T available for 70 cm.



DR-570T

Set your sights for dual!

The Alinco DR-570T Twin Bander has dual LCD readout, volume, squelch and tuning controls. Double

DR-510T

Best Dual Value on the Market!

The Alinco DR-510T has most of the outstanding features of it's sister the DR-570T. 10 memory channels, cross band duplex and tone squelch. The dual band LCD, handy, and simple user controls are simply the key word. The DR-510T with 45W on 2M and 35W on 70 cm is the best featured dual bander on the Amateur market today. See the DR-510T along with the other Alinco [illegible] at your favorite dealer today!

DR-[illegible]T (NEW)

ALINCO ELECTRONICS

DJ-560T (NEW)

Full Featured Twin Band Handy

We packed almost all of the features you would find in a full sized mobile Twin Bander into this compact HT. The DJ-560T has key board entry, CTCSS encode built in, several scanning modes, 40 memories, fully programmable. Autodialer, Dual Display (2 Meter & 70 Cm). The DJ-560T is sitting on top of the mountain.

DJ-100T & DJ-120T & DJ-200T

Best 2M Micro Value

The Alinco DJ-100T/DJ-120T is "Magnificent" for its tiny size, but stands up to the competition with power and capability. 10 memory channels store offsets and subtones. Has LCD readout with call channels and reverse at your fingertips. 500 mah battery with direct DC to DC. Standard 3W on standard battery, 6W on optional battery leaves the competition in the dust! DJ-200T for 220 MHz.

DJ-500T

Power-Packed Dual Handi

20 Memory channels, subtones, built-in DC to DC, 700 mah nicad battery, LCD readout with 6W on 2M and 3W on 70cm (with optional battery) 50 channels, DTMF touchtone, and direct keyboard entry, are just the few winning features of the Alinco DJ-500T Dual Band Handheld. Easy to use, and Value Priced at your Alinco Dealer.

DJ-160T & DJ-460T

2M H/T's go head And wow!

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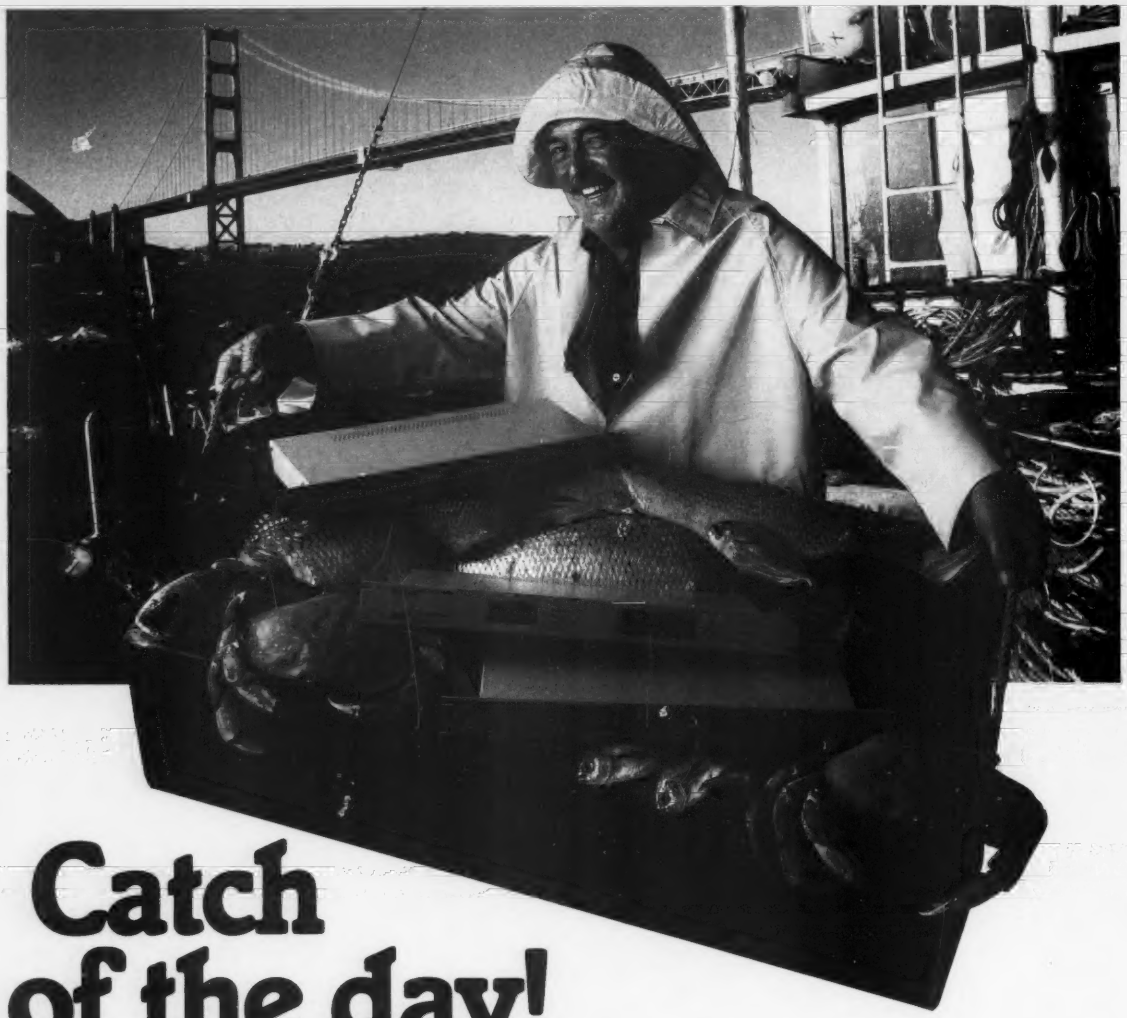

Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.

$595.00 each
$59.95 DTMF module
$149.95 Digital CTCSS modu

Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

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1990 Scholarship Winners

Five young amateurs are heading off to college this fall with assistance from The Dayton Amateur Radio Association. The five are winners of the association's 1990 scholarships.

Each student received $1,500 toward their tuition at the school of their choice. This program is open nationwide to any FCC licensed amateur radio operator graduating from high school in the year the award is given. There are no restrictions on class of license or course of study planned.

Mary K. Beardslee N8HEY of Kingwood, West Virginia, received the Robert F. Zimmerman Memorial Scholarship. She holds a General Class license and attends Potomac State College.

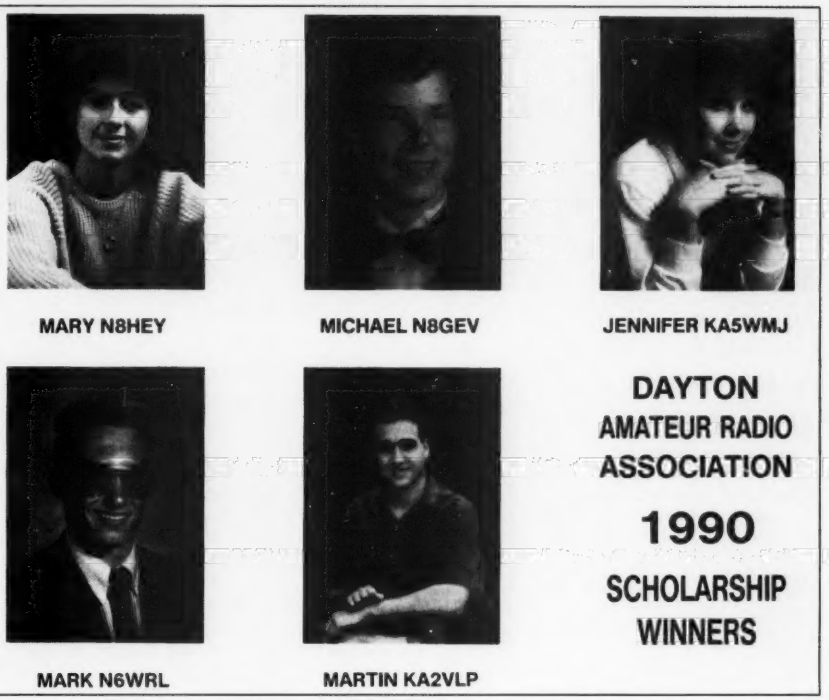
The Charles G. Frye Memorial Scholarship was awarded to Mark Hendrixson N6WRL of Orange Cove, California. Mark holds a Technician Class license and attends Brigham Young University.

The third scholarship went to Martin Gruen KA2VLP of Barrington, New Jersey. He holds an Advanced Class license and will attend Stetson University.

Jennifer Doerrie KA5WMJ of Booker, Texas, was awarded the fourth scholarship. She holds a General Class license and attends Odessa College.

Michael Adams N8GEV of Chula Vista, California, received the fifth scholarship. He holds an Extra Class license and attends Southwestern College.

Applications for the 1991 program will be available after January 1, 1991. Write *DARA Scholarship, 317 Ernst Avenue, Dayton OH 45405.*



Winners of the 1990 Dayton Amateur Radio Association scholarship awards.

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback#	Title
1	Letters
2	Never Say Die
3	QRX
4	Quick and Easy Field-Strength Meter
5	Review: AEA IsoLoop
6	Ham Profiles
7	75 Meter 1/4-Wave Sloper Array
8	Alinco Service Survey
9	Dummies for 13.8 Volt DC Supplies
10	Mobile Power Source Organizer
11	End-Fed Copper Dipole
12	More BTUs for the Buck
13	10 Meter Base Station Antenna
14	Solution: AGC
15	Make Your Own Circuit Boards
16	Ham Help
17	Hams with Class
18	Review: Fluke Model 87
19	Build a Portable Mast Mount
20	The Coil Tester

Feedback#	Title
21	Review: Ameritron AL-82
22	Review: Weller Cordless Pyropen
23	Ask Kaboom
24	DX
25	Special Events
26	Updates
27	New Products
28	Hamsats
29	Homing In
30	Above & Beyond
31	Ad Index 9/90
32	Keyword Index 9/90
33	Dealer Directory
34	73 International
35	ATV
36	RTTY Loop
37	DXDA '90
38	Barter 'n' Buy
39	QRP
40	Random Output
41	Propagation

75 Meter 1/4-Wave Sloper Array

Confessions of a contester.

by Alan Hoffmaster WA3EKL

There comes a time in every ham's life when he's got to own up, and I guess it's my turn to let the cat out of the bag.

A 75 meter quarterwave sloper falls into one of two categories. It either works great or it doesn't work at all. A number of hams I have talked to over the air have fallen into the second category, but with a simple modification, they're now enjoying first-category status. OK, get the net ready, because here comes the cat!

Sloper Secrets

The one factor with the greatest effect on a quarterwave sloper's performance is how physically close the top end of the sloper is to the tower leg. If the top of the sloper is more than [illegible] inches from the tower leg, it doesn't work at all. It took me a year and a half to discover this. I went from 20th place in a DX pileup to 2nd or 1st place.

There is another trick that helps in working DX. Some antenna sources say to make the angle between the tower and the sloper 45 degrees. This works very well for East Coast–West Coast communication, but it's a very poor angle for DX contacts. The optimum angle for DX contacts appears to be 30 degrees between the sloper and the tower, or 60 degrees between the sloper and the ground. This means you need a tower about 65 feet high for a ¼-wavelength 75 meter sloper.

However, if you have a 50-foot tower you still can achieve good performance from a modified sloper. Attach the sloper to the top of your tower and pull it out so that it makes a 30 degree angle with the tower. About 10 feet up the tower, attach a rope and pull it out parallel with the ground until it contacts the sloper wire. Tie the rope to the sloper at this point. Now pull the remaining sloper wire out parallel with the ground and tie it off to some other 10-foot support point. (See Figure 1.)

Sloper Array for DX

I will now explain my system in detail. First there are three ¼λ-slopers hanging down from the top of a 65-foot tower, one off of each leg, spaced 120 degrees apart. Each sloper makes a 30-degree angle with the tower. Each sloper is fed from a remotely controlled coaxial relay box, thus requiring only one coax feed from the shack. A 24-inch length of 50-ohm coax extends from the box to a homemade bracket on each leg of the tower, very close to the top of each sloper. The bracket consists of a 3-inch length of ¾-inch diameter soft copper tubing, which I mashed flat with a hammer.

One end was rolled around a ⅜-inch bolt in order to create a cylinder about the size of the outer braid of a piece of RG-213 coax. About half an inch from the other end, I drilled two holes for mounting the bracket to the tower leg with a U-bolt. Next I cut back about one inch of the outer jacket off the 24-inch length of coax. I removed ⅜-inch of the braid to expose the insulation. I then tinned the braid, which I inserted into the cylinder end of the bracket and soldered in place.

I removed about a quarter-inch of the insulation sticking out of the bracket, exposing the center conductor. After mounting the bracket/coax assembly to the tower, I soldered a short piece of #12 wire between the center conductor of the coax and the top of the sloper. The bracket assembly was then waterproofed with coax seal.

One final note. The coax box shorts all unused ports to ground. Therefore, two of the slopers are grounded at all times. The system was tuned by shortening or lengthening each sloper until the SWR was lowest at the frequency I wanted.

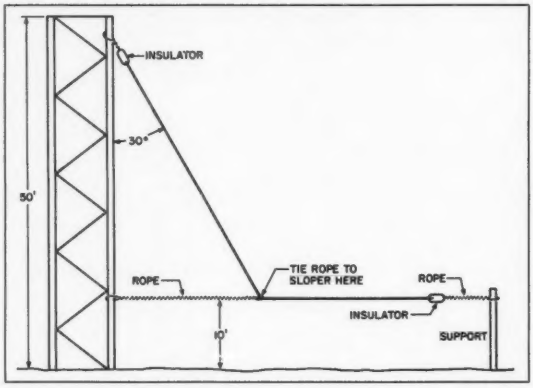


Figure 1. Thirty degrees between the sloper and the tower seems to be the optimum angle for DX contacts.

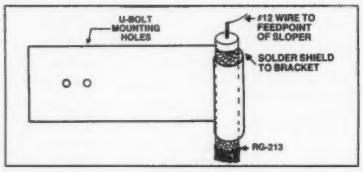


Figure 2. Bracket and feedline mounting details.

Results

The response I have received from DX stations has been overwhelming. During a DX pileup the south sloper usually requires from one to three calls to get the station. The northeastern sloper requires six calls at the most, and the western sloper nine at most. Considering the competition during a major DX contest, that's fairly good.

I seem to be able to hear and work DX stations on the slopers that I can't even hear on the inverted-V at 65 feet. There also appears to be about a 5 dB difference between the V and the slopers. Between the slopers themselves there is about a 6 dB difference on the sloper in the preferred direction.

I know the system is working because we've been averaging between 55 and 65 countries per DX contest in the past few years. Good luck with your system, and good DX.

Contact Alan Hoffmaster WA3EKL at 929 Andrews Road, Glen Burnie MD 21060.

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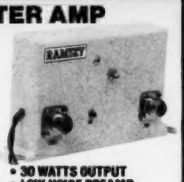
Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output allowing you to hit the repeaters full quieting while the low noise preamp remarkably improves receptions. Ramsey Electronics has sold thousands of 2 mtr amp kits but now, we offer completely wired and tested 2 mtr as well 220 MHz units. Both have all the features of the high priced boosters at a fraction of the cost.



PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested **$79.95**
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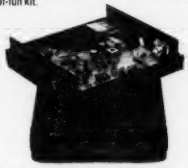
- 30 WATTS OUTPUT
- LOW NOISE PREAMP
- LOW COST
- RUGGED CAST ALUMINUM CASE
- ONE YEAR WARRANTY

Complete kit, SG-7 **$89.95**

PERSONAL SPEED RADAR

New low cost microwave doppler radar kit "clocks" cars, planes, boats, horses, bikes, baseballs, models, runners or virtually anything that moves. Operates at 2.6 GHz with over 1/4 mile range. LED digital readout displays speeds in miles per hour, kilometers per hour or feet per second! Earphone output permits listening to actual doppler shift. Uses two 1 lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes deluxe ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.



RADIOS

20, 40 & 80 METERS HAM RECEIVERS

Sensitive all mode, AM, CW, SSB receivers for 3.5—4.0 or 70—75 MHz. Direct conversion design using NE602 IC as featured in QST and ARRL handbooks. Less than 1 μv sensitivity, varactor diode tuned, 50 mw audio output. Runs on 9VDC, has RF gain control. This kit is very easy to build, lots of fun and educational—ideal for the beginner or the old pro. The optional matching case kit features a rugged ABS plastic case with screened graphics. Included are machined aluminum knobs for a well-finished professional look.

20 MTR receiver kit HR-2 **$24.95** | 40 MTR receiver kit HR-4 **$24.95** | 80 MTR receiver kit HR-8 **$24.95** | Receiver case CHR **$12.95**

QRP TRANSMITTER KITS, 20, 40 & 80 METERS

Operate a mini ham shack. These little CW rigs are ideal mates to our 40 and 80 meter receivers. Features include smooth variable tuning, one watt output and excellent keying characteristics. Runs on 12 VDC and is VSWR protected. See how far you can stretch your signal with one of these mini rigs. Optional ABS cases are available.

20 MTR QRP kit QRP-20 **$29.95** | 40 MTR QRP kit QRP-40 **$29.95** | 80 MTR QRP kit QRP-80 **$29.95** | Case kit CQRP **$12.95**

AIRCRAFT RECEIVER KIT

Hear exciting aircraft communications—picks up planes up to 100 miles away. Receives 110—136 MHz AM air band, varactor tuned superhet design with AGC, ceramic filter and adjustable squelch. Runs on 9V battery, 50 mw audio output, 1 μv sensitivity. Optional matching ABS plastic case lets you take it anywhere, features screened graphics and machined aluminum knobs for a real professional look. Compact—great for airshows or for just plain hanging around the airport.

Complete kit, AR-1 **$24.95** | Receiver case kit, CAR-1 **$12.95**

SHORTWAVE RECEIVER KIT

A fantastic receiver that captures the world with just a 12" antenna! Receives 4—11 MHz in 2 MHz bands, varactor tuned, superhet design with AGC, RF gain control, and 50 mw audio output. Uses new Signetics mixer chip for less than a microvolt sensitivity, runs on 9V battery. This is a fascinating scout, school or club project, and will provide hours of fun even to the most serious DX'er. Add the optional case kit and you have a real nice looking shortwave set.

Complete kit, SR-1 **$24.95** | Receiver case kit, CSR-1 **$12.95**

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software, PC board, all necessary parts and full documentation.

Complete kit, PC-1 **$49.95**

FM COMMUNICATIONS/ 2 MTR, 10 MTR & 220 RECEIVERS

Sensitive superhet FM receiver tunes any 5 MHz segment of band. Listen to ham operations, high band police calls, weather or mobile phone calls! Easy to build receiver features varactor tuning, IC mixer stage, ceramic IF filters and dual conversion design with adjustable squelch. Less than 1 μv sensitivity, runs on 9 V battery, with 50 mw audio output. Optional ABS case with screened graphics and machined aluminum knobs provide a nice professional look.

2 MTR kit FR-7 **$29.95** | 10 MTR kit FR-10 **$29.95** | 220 MHz kit FR-20 **$29.95** | Receiver case kit CFR-7 **$12.95**

NEW MINIKITS—NEW MINIKITS

BROADBAND PREAMP

A sensitive all purpose preamp, ideal for scanners, TV sets, VHF, UHF rigs, counters, etc. Features low noise, 4 db NF, 20 db gain, 100 KHz—1 GHz operation. Runs on 9—12 VDC, 50 ohms input.

Complete kit, SA-7 **$14.95**

LIGHT BEAM COMMUNICATORS

Transmits modulated infrared light up to 30 feet without lenses, up to 1/4 mile using lenses. Uses 30 KHz carrier for hum-free operation, transmits thru windows, etc. Ideal for "bugs" or listening to IR remote controls. Transmitter has sensitive mike input, receiver uses PIN detector and drives speaker output. Units operates on 9—12 VDC.

Transmitter kit, LB-6 **$8.95**
Receiver kit, LB-5 **$9.95**

HIGH POWER FM WIRELESS MIKE

A high power unit that will transmit up to 1/2 mile to any FM broadcast radio. Sensitive input accepts any type of mike, will pick up normal voices 10 feet away using the available mini-electric mike cartridge. Operates on 9—12 VDC

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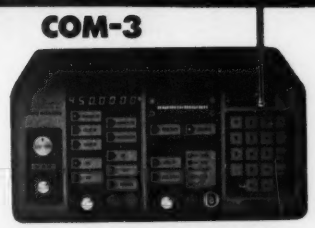
COM-3



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MINI KITS—EASY TO ASSEMBLE—FUN TO USE

TONE DECODER A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.

Complete kit, TD-1 **$5.95**

40 WATT 2 mtr PWR AMP Simple Class C power amp features 8 times power gain 1 W in for 8 out, 2 W in for 15 out, 5 W in for 40 W out. Max output of 50 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 40 W pwr amp kit **$27.95**
TR-1, RF sensed T-R relay kit **6.95**

COLOR ORGAN See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110VAC.

ML-1 Kit, **$8.95**

VOICE ACTIVATED SWITCH Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED or even a tape recorder motor. Runs on 9 VDC.

VS-1 KIT **$6.95**

VIDEO MODULATOR Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit JM-7 **$12.95**

LED BLINKY KIT Alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights. Runs on 3 to 15 volts.

BL-1 Kit, **$3.95**

MAD BLASTER Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC

MB-1 Kit **$4.95**

UNIVERSAL TIMER Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

WHISPER LIGHT An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.

WL-1 Kit **$6.95**

FM WIRELESS MIKE Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 Kit **$5.95**
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SIREN Produces upward and downward wail. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.

Complete kit, SM-3 **$3.95**

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60 Hz TIME BASE Runs on 5-15 VDC. Low current (25ma) 1 min/month accuracy

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TELEPHONE TRANSMITTER Low cost with professional performance. Features include; self phone line powered, tunable from 76 to 100 MHz, polarity antisensitive, compact size (½" x 1¼"), easily installs anywhere on the phone line or inside the instrument itself.

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FM RECEIVER For built-in applications or hobby experimentation. Full fledged superhetrodyne receiver, microvolt sensitivity, 10.7 MHz IF. Integrated Circuit detector, 50 mw audio amplifier, 9V external power source, operation on standard FM broadcast band as well as large portions on each side, compact (6" square), for bug detection or reception

FR-1 KIT **$14.95**

FM MINI MIKE A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit **$16.95**
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MICROWAVE INTRUSION ALARM A real microwave doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz and is not affected by heat, light or vibrations. Drives up to 100 ma output, normally open or closed, runs on 12 VDC.

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SPEECH SCRAMBLER Communicate in total privacy over your telephone or radio. This scrambler kit features full duplex operation using frequency inversion. Runs on a 9 volt battery. Both mike and line or speaker output/inputs. Easy to connect to any radio—telephone use requires no direct connection! Easy to build, uses IC DSM circuitry. Can also be used to descramble most com. scramblers.

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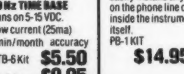
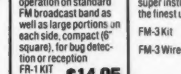
CT-70 7 DIGIT 525 MHz



$139.95 WIRED, INCLUDES AC ADAPTER

CT-90 9 DIGIT 600 MHz



$169.95 WIRED INCLUDES AC ADAPTER

CT-50 8 DIGIT 600 MHz

$189.95 WIRED INCLUDES AC ADAPTER

CT-125 9 DIGIT 1.2 GHz

$189.95 WIRED INCLUDES AC ADAPTER

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High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail for CT-70, 90 & 125	3.95
Nicad pack for CT-70, 90 & 125	8.95

MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
CT-70	20 Hz-550 MHz	< 50 mv To 150 MHz	1 PPM	7	1 Hz, 10Hz, 100Hz	139.95
CT-90	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 Mhz	1 PPM	9	0.1Hz, 10Hz, 100 Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.95

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CIRCLE 34 ON READER SERVICE CARD

Alinco Service Survey

Alinco may be the best show in town.

by Gordon West WB6NOA

Our service survey takes a close look at Alinco, an energetic and enthusiastic provider of amateur radio VHF and UHF equipment. Alinco is fourth place in distribution volume, with Heathkit close, the latter importing Standard Radio equipment for U.S. distribution. Alinco handheld and mobile sets are produced in Japan, but they're marketed abroad under the Cirfolk label.

This September, Alinco Electronics, Inc., is moving to a new location. See the table for details.

The Alinco Family

Alinco Electronics, Inc., is a member of "The Alinco Group," the parent company which produces all Alinco equipment in Osaka, Japan.

"All of our equipment is made in Japan," says Mark Morisato JN3HSG, vice-president of the Alinco U.S.A. facility. All Alinco equipment is of Japanese origin, a point underscored to eliminate any confusion with equipment possibly manufactured in Korea or China. Nor is any Alinco equipment connected to any equipment produced by Azden, Santec, or N.D.I. Alinco equipment is unique.

Greg Pearson KC6LSY, a newly licensed Technician Class operator, was recently appointed Alinco's sales manager. He says, "We have been around here five years, and we plan to stay. You can see that by our aggressive double-page advertising programs—we want everyone to know about Alinco equipment, and we especially want *73* readers to know about the unique Alinco repair program."

Photo A. The Alinco crew, left to right: Vice-President Mark Morisato, Service Engineer Ahmed Awad, and Sales Manager Greg Pearson KC6LSY.

The Service Facility

The Alinco service facility has just one full-time service engineer. In fact, they have never had more than one—Mr. Ahmed Awad, a good-looking man with a wall full of technical certificates, including a BSEE.

Smiling, Awad says, "I helped design the products for the Japanese; I Quality Control every single transceiver coming in and going out, and I am the only one who will ever lay a hand on a unit to get it fixed."

And he does his job quickly. An inspection of his service log reveals one-day turnaround on all repairs. Ahmed: "And if they come in here Blue Label, we send them out that way, too, recognizing that the amateur radio operator wants his equipment fixed quickly and professionally, and returned immediately."

Automatic Coverage

Alinco equipment is serviced free of charge for the first six months after the dated sales receipt. For a flat rate of $38, the equipment is covered for an additional 1½ years. This rate covers any and all parts, plus any amount of labor to get it fixed. However, you don't have to pay the $38 coverage charge in advance.

Mr. Shunsaku Inoue, President of Alinco in Japan, happened to be visiting Alinco U.S.A. on the same day as our service survey. He commented: "The amateur radio operator doesn't need to spend a nickel to obtain this extra 1½-year flat-rate program—it's fully automatic. All they need to do is to send in their equipment with a copy of their original sales slip, or have a warranty card on file, and this automatically qualifies them for our $38 fix for any type of problem."

After two years, out-of-warranty equipment is repaired at $40 per hour. Most out-of-warranty repairs are under $100. Most of that cost may be for a 45-watt preamplifier brick which runs about $70, or a handheld preamplifier brick for $30. "Our PA amplifiers are extremely strong—they are usually the last thing to ever go wrong."

Common Repairs and Prevention

What are the most common repair problems with Alinco sets? Cracked boards from

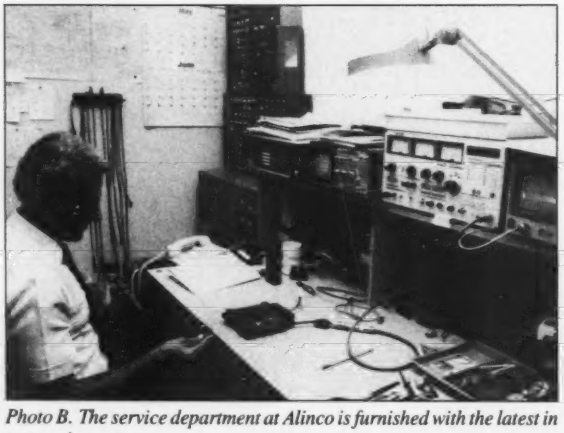

Photo B. The service department at Alinco is furnished with the latest in test equipment.

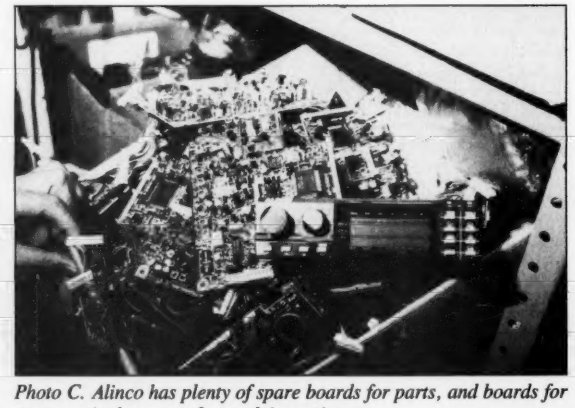

Photo C. Alinco has plenty of spare boards for parts, and boards for swap-out in the event of a tough intermittent.

dropped units and blown caps on reverse polarity hook-ups without a fuse. Every once in a long while, the service engineer says, they find a fractured chip resistor that may not have seated properly during robotic assembly in Japan.

Out-of-band modifications are overlooked for the repair problem. This means that if the out-of-band mod did not wreck the unit, it won't be replaced with normal circuitry. However, Alinco candidly admits that out-of-band modifications are sometimes botched by a ham untrained to work on surface-mount technology.

Every piece of new equipment coming in from Japan is opened up and tested at the Alinco Southern California facility. And that means *every* piece is tested, not just one or two samples out of each shipment. The larger companies don't have time, but at Alinco, it doesn't go to the dealer for distribution until it has been tested.

Come On, Guys! How About It?

Alinco echoed the sentiments of Kenwood, Yaesu, and ICOM about sending in your equipment for repair service: PACK IT BETTER AND GIVE US A BETTER DESCRIPTION OF WHAT CAUSED THE UNIT TO FAIL OR WHAT THE PROBLEM IS.

In other words, if you accidentally ran your alternator with no battery load into the 12-volt DC input to a handheld, causing it to smoke, tell them. Maybe your unit fell into the water, but you completely cleaned it out with an air hose. Let them know any steps you took to correct the problem. Describe *exactly* what happened, or the circumstances under which your unit stopped working! The more information you give, preferrably in writing, the easier it will be for the engineer to track the problem down and the faster he will be able to repair your equipment.

The Alinco service department has plenty of parts on hand for any fix. They even have replacement boards on hard-to-trace intermittent problems. "If it's an intermittent we just can't seem to find, we'll swap out the board."

Looking over their parts bins, they could easily rebuild any one of their seven different mobile VHF and UHF units, and any one of their six different VHF and/or UHF handheld sets.

On average, Alinco receives seven units each day in for repair. These units usually go out the next day, but it may take a few extra days to locate the source of intermittent problems. If there is any delay, Alinco calls the customer. This is why it's important to put your daytime and evening phone numbers on the suggested *73 Magazine* repair form (see the March 1990 issue of *73*) or the letter you send with your equipment. The engineer may need to call you directly.

Units out of warranty are shipped back C.O.D.

Customer Response

Alinco was quick to pull out their correspondence file and show us several letters with favorable comments from Alinco users whose equipment required factory service. All the letters illustrated how surprised they were to find the equipment back within a week of being shipped out.

Because the Alinco service department revolves solely around one service engineer, "the buck stops here" could very well be their motto. The same could be said for the one-day service, with only one person responsible for sending the unit back to the customer.

Alinco recommends that all units be shipped directly to them for repair, bypassing the dealers. "Our valuable dealer network is in place for selling the fabulous Alinco line of single-band and dual-band equipment. We will take care of all necessary repairs." Taking a close look at the surface mount technology inside Alinco sets, I can see why it's best to let the engineering professional work on it. And, of course, Alinco has a plethora of the latest test equipment at their disposal.

Ready to Grow

While you may call Alinco service a one-man show, it could very well be the best act in town. Currently the #4 player of U.S. amateur radio VHF and UHF equipment distribution, their volume is growing through their aggressive advertising program and popular acceptance by the hams owning Alinco equipment. Chances are, more technicians will join the service crew. But for now, Alinco's service engineer stands alone and ready for any incoming repair—a repair that will receive his prompt and personal attention.

Next month we'll cover the service departments of two companies—Land Air Communications, an independent service agency in New York, and General Electric—who may be able to fix ANY brand of amateur radio equipment, old or new. 73

You may contact Gordon West WB6NOA at 2414 College Dr., Costa Mesa CA 92626. FAX (714) 434-0666. Tel. (714) 549-5000.

Alinco Electronics, Inc.

- President: Shunsaku Inoue
- Vice-President: Mark Morisato
- Service Engineer: Ahmed Awad
- Sales Manager: Greg Pearson KC6LSY

Until September 10, Alinco's address is 20705 S. Western Avenue, #104, Torrance CA 90501.

On or around September 10, 1990, Alinco will move to a spacious new office and service facility at: **438 Amapola Ave., #130, Torrance CA 90501.**

The phone and FAX numbers will remain the same: **Tel. (213) 618-8616; FAX (213) 618-8758.**

If you've sent any equipment to Alinco's old address, don't panic. All incoming gear to the old address will be automatically forwarded down the street to their new facilities.

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CIRCLE 91 ON READER SERVICE CARD

Dummy Loads for DC Supplies

Don't risk your rig!

by David Vail VE1GM

Anyone who builds regulated power supplies for today's low voltage, high-current equipment should consider having a suitable dummy load for thoroughly testing the power supply *before* connecting it to an expensive piece of equipment. If the voltage regulation should fail during development and testing, overvoltage could damage your new super-duper transceiver or amplifier.

When you're looking for a suitable transformer for your supply, you can also use a dummy load to check the voltage sag on a secondary winding at various currents.

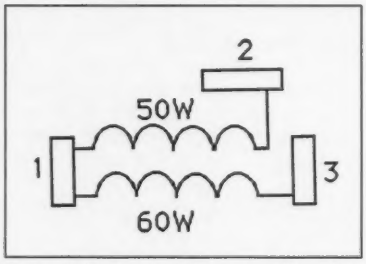

Figure 1. Connections for one headlamp (see table).

Single Headlamp Connections	
Terminals 2 & 3	3 amps
Terminals 1 & 2	4 amps
Terminals 1 & 3	5 amps
Terminals 1 & 2+3	9 amps

Simple Dummy Load

My junk box contained an unused sealed beam automotive headlamp marked "60/50W 12 volts." At 13.8 volts, the 50 watt filament draws 4 amps, and the 60 watt filament draws 5 amps. Both filaments in series draw 3 amps, and both filaments in parallel draw 9 amps. Used as a dummy load, this simple device makes a dummy load capable of drawing four different values of current. Since these lamps are designed for continuous operation, they may be safely used for long periods of testing.

More Versatile Dummy Load

Two of these sealed beam headlamps make a dummy load capable of drawing 11 different values of current, namely: 1.5, 2, 2.5, 3, 4, 5, 6, 8, 9, 10 and 18 amps. You can test just about any 13.8 volt power supply that you'd use in a ham shack, at a price that's hard to beat.

With this dummy load, you can experiment with power supply design, construction, and adjustment. You can check such things as the adequacy of pass transistor heat sinks, stability and reliability of voltage regulators at various output currents, and the trip points of overvoltage protection circuits. You can do all this without putting your valuable radio equipment at risk.

Checking Power Transformers

Automotive headlamps should safely withstand 16 volts. For brief periods, you can use them at 18 volts to check the voltage sag across low voltage secondary windings. At 15 volts, the load's current drawn will be about 8% higher than at 13.8 volts; at 18 volts, it will be about 30% higher.

Connections

To minimize voltage drop across the leads, make connections to and between the lamps with fairly heavy wire. Number 12 wire would be suitable for the maximum load of 18 amps. Headlamps have provision for using push-on connectors, which makes it convenient to interconnect the two lamps for different load values. The illustration shows how to interconnect the lamp filaments for the various load values.

David Vail VE1GM, 50 Porter Street, Yarmouth, N.S. B5A 2Y9.

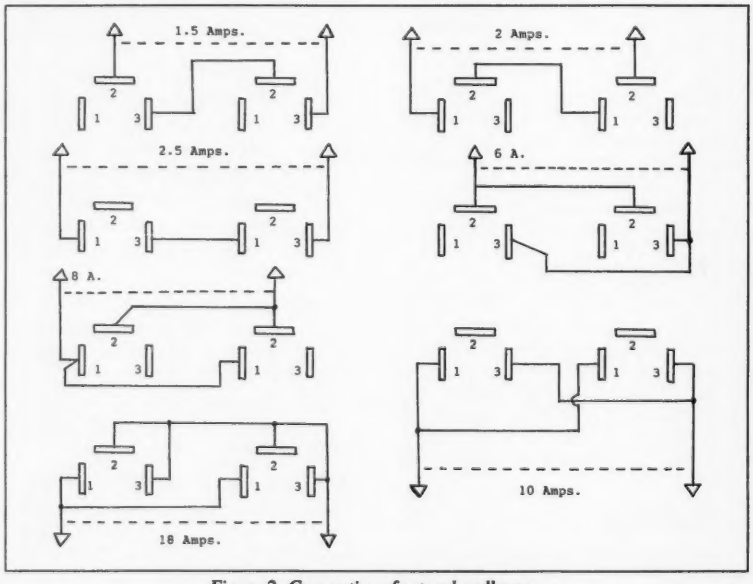

Figure 2. Connections for two headlamps.

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$12,000,000 Scanner Sale

Uniden Corporation of America has purchased the consumer products line of Regency Electronics Inc. for $12,000,000. To celebrate this purchase, we're having our largest scanner sale in history! Use the coupon in this ad for big savings. Hurry...offer ends January 31, 1991.

★★★ **MONEY SAVING COUPON** ★★★

COUPON COUPON

Get special savings on the scanners listed in this coupon. This coupon must be included with your prepaid order. Credit cards, personal checks and quantity discounts are excluded from this offer. Offer valid only on prepaid orders mailed directly to Communications Electronics Inc., P.O. Box 1045 – Dept. UNI4, Ann Arbor, Michigan 48106-1045 U.S.A. Coupon expires January 31, 1991. Coupon may not be used in conjunction with any other offer from CEI. Coupon may be photocopied. Add $12.00 for shipping in the continental U.S.A.

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Bearcat 800XLT-A $229.95
Bearcat 200XLT-A $229.95
Bearcat 100XLT-A $179.95
Bearcat 70XLT-A.....$139.95
Bearcat 55XLT-A.....$99.95
Bearcat 210XLT-A $164.95
Uniden CARD-A1.....$144.95
Uniden RD3XL-A1 .....$144.95
Uniden RD9XL-A.....$119.95

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Bearcat® 760XLT-A

List price $499.95/**CE price $254.95/SPECIAL**
12-Band, 100 Channel • Crystalless • AC/DC
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 760XLT has 100 programmable channels organized as five channel banks for easy use, and 12 bands of coverage including the 800 MHz. band. The *Bearcat* 760XLT mounts neatly under the dash and connects directly to fuse block or battery. The unit also has an AC adaptor, flip down stand and telescopic antenna for desk top use. 6-5/16" W x 1⅝" H x 7⅜" D. Model **BC 590XLT-A1** is a similar version without the 800 MHz. band for a new low price of only $194.95. Order today.

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KT280-A *Uniden* Family phone with 911 feature...$29.95
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RELM® RH256B-A

List price $587.50/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority
The *RELM* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-A** is available for $429.95. A UHF 15 watt, 16 channel version of this radio called the **RU156B-A** is also available and covers 450-482 MHz. but the cost is $454.95.

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The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 810E to the 310E handheld, there is no better Citizens Band radio on the market today.

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RD9XL-A1 *Uniden* "micro" size radar detector ...$124.95
RD27-A *Uniden* visor mount radar detector.....$54.95
RD99GT-A *Uniden* remote mount radar detector...$119.95
CARD-A1 Uniden credit card size radar detector...$159.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A** for only $189.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz. band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." With nothing excluded in the 806-912 MHz. band, this scanner is an excellent choice for law enforcement agencies. If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

NEW! Bearcat® 147XL-A

List price $189.95/**CE price $94.95/SPECIAL**
10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC
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Mobile Power Source Organizer

Easy 12 volt hookups for your mobile gear.

by David K. Pelaez AH2AR/8

When operating a mobile or portable station from my car I always wind up asking myself the same question; "Where am I going to get additional 12 volt lines for the transceiver and the amplifier?" Aside from the obvious safety considerations, this is one of the universal problems with running an amateur TV transceiver as a temporary portable mobile station. You may also need to run other ham radio gear in your vehicle on a temporary basis. For example, the addition of a provisional packet station may need different power connection schemes than what is already available. Using various patch cords to connect up through a cigarette lighter jack or to the fuse block under the dash can be adequate, but the final outcome in interfacing more than one "temporary" 12 volt connection to several pieces of gear starts to take on the appearance of an artfully-prepared multicolored bowl of spaghetti.

To help tame the tangled disorder of a temporary transceiver and amplifier setup within the family wagon, look no further than the junk box or the local Radio Shack store. It is possible to run a 12 volt lead directly from the automobile battery and terminate this run to an enclosure that organizes the various 12 volt connection schemes. This will give you a means to readily obtain power to supply 12 volt DC to different types of ham gear.

The Saving Circuit

You can custom design the features in this mobile power source organizer to suit your own needs. In the design described in this article I used features that I found indispensable for my particular applications, including:

1. Capability to run up to 20 amps.
2. A means of filtering the DC prior to the power entering the equipment.
3. A main power switch and a power indicator light.
4. Several connection schemes that include terminal posts and an RCA type chassis-mounted phono jack to supply power to the temporary gear.

Any type of metal chassis will make a suitable enclosure. I used an aluminum box that I picked up at a hamfest. Be sure to use heavy gauge insulated wire (I used 12 gauge multistrand) in all of the point-to-point connections. This insures that your organizer can handle the designed 20 amp load. The run of cabling from the 12 volt battery to the enclosure should also be 12 gauge. I opted to run this line directly to the battery so the additional load would not overload the automobile circuits.

Several types of noise filters are suitable for this project. I used a Radio Shack design. The heavy-duty noise filter from Radio Shack helps lessen the chance of ignition noise getting into the ham gear hooked up to the organizer. This filter will also alleviate alternator whine while transmitting. It has two mounting lugs to attach it to the bottom of the chassis, making it easy to place inside the enclosure. The filter is embedded in epoxy and uses some heavy-duty chokes and a capacitor. It becomes a "passive" part of the circuit, placed in series with the +12 volt line after the line passes through the fuse and the switch on the organizer. The black wire coming out of the filter is then connected to one of the mounting lugs attached to the enclosure chassis ground.

Depending on the type of terminal posts that you use, make certain that the +12 volt post doesn't come in contact with the automobile chassis as you move the organizer inside of the automobile. Most of the terminal posts that are currently available are properly insulated (the ones from Radio Shack are) so this situation may not be a problem for you.

The World War II era posts that came out of my junk box were not designed this way so I have resorted to putting a plastic cap on the positive terminal when my organizer is not being used. I don't recommend putting more than a 5 amp load on the phono type jack, but I have found that these jacks make very convenient low-current power supply jacks.

The Results

It took about two hours to build the organizer. The hardest part of the project was determining where to pass the 12 volt cable through the fire wall of the automobile.

After feeding the cabling through and placing the organizer in the auto, it was time to give the organizer the acid test. The following day I took the car up to Bellefontaine, Ohio, (highest elevation in Ohio) and worked ATV DX from the parking area at High Point. As a side note, when not hooked up and in use, the mysterious-looking box in the auto can be used to dissuade back seat drivers from attempting to verbally take over the steering wheel. Right below the power-on toggle switch and the indicator light you could place red DATAK lettering stating: "EJECTION SEAT ARMED."

Parts List	RS #	$ Cost
SPST switch (25 amp)	275-708	1.99
Fuse holder	270-739	.99
Fuse (25 amp)	Bus type	.99
Terminal posts	274-662	1.59
Heavy-duty noise filter	270-055	17.95
LED 12 volt chassis mount	276-011	1.99
Chassis	——	——
12 gauge insulated wire	——	——
Phono jack (RCA type)	274-346	4 for $ 1.99

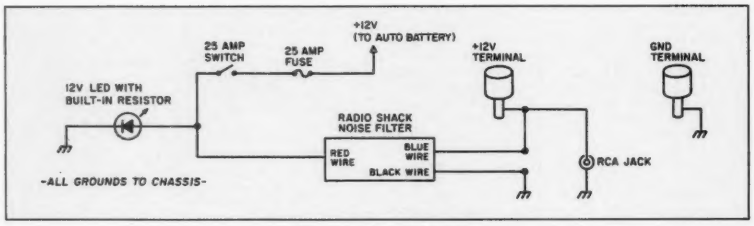

Figure 1. Circuit layout.

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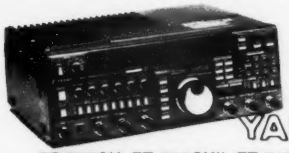

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FT411-811-911 IC02AT/32AT
FTC-1903/1123 IC2/4GAT/24AT
FTH-2008/7008 IC-A20/U16

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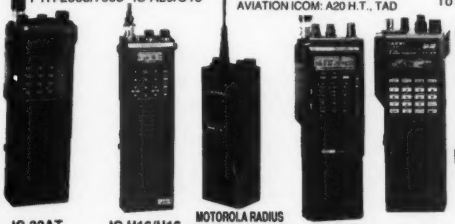

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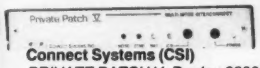

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CIRCLE 41 ON READER SERVICE CARD

End-Fed Copper Dipole

Why buy when you can build?

by Mike Gray N8KDD

I needed a good 2 meter antenna which would be suitable for both stationary mounting and remote-site use. I could have purchased an antenna which would meet the requirements, but that wouldn't satisfy the burning desire to build something, and I can build eight antennas for the price of one commercial vertical.

This project is easily constructed from parts found in any plumbing supply store. It can be tuned to any frequency, but the overall distance from the lower coupler to the top of the upper element should be less than 40 inches. Wind may cause problems with a longer antenna.

See the "Components List" for this project. Most of us have some scrap plumbing in the garage. The pieces are too short to use but too good to throw away. Drag it out—you saved it for a project just like this! You will also need a propane torch, a tube cutter, and a bottle of PVC pipe cement.

Tubes

Start by cutting two copper tubes to the proper length for the frequency at which you intend to operate. Make them a little longer if you like, and shorten them during the tuning phase.

¼-wave element (inches) = 2808/frequency(MHz)

File the inevitable burrs from both ends of each tube and polish them bright with sandpaper. While you have the sandpaper in hand, polish the inside of one end of each tube to prepare it for solder.

Heating the outside of the copper tube with a torch, tin the inside of one end of each copper tube with rosin-core solder. Cut the PVC pipe to length. Make it a minimum 12 inches, but not longer than 30 inches. If the PVC pipe is much longer the force imparted to the lower coupler during a wind storm may be more than the coupler can take.

Cement a coupler to one end of the PVC tube, and slide one of the copper tubes into the coupler. Don't cement the copper tube to the coupler yet.

Cable

Feed the coaxial cable through the PVC pipe, and through the copper pipe. The cable should come through the tinned end of the copper pipe.

Strip ¾-inch of jacket from the cable. Separate the braid from the center dielectric, then twist it together to form a conductor equal in length to the center conductor. Tin the center conductor and the twisted braid no more than ¼-inch from the end. (The braid needs to remain flexible for this to work).

Bend the braid into a "J" shape and solder it to the inside of the tinned end of the copper tube. Heat the outside of the tube—don't burn the cable.

Photo A. The completed antenna.

Once the braid is soldered to the lower tube, pull the coax through the tube as far as the braid will allow it to go. Slide a coupler over the coax and onto the copper tube. Solder the center conductor to the inside of the upper tube in the same way that you soldered the braid to the lower tube.

Slide the upper element into the coupler and seat it gently. If it won't slide all the way in, polish the copper tube with sandpaper.

Measure the resistance between the upper and lower elements. If the meter indicates that the elements are connected electrically, pull the assembly apart and track down the short. Do not attempt to tune the antenna unless the meter indicates infinite resistance between the copper elements.

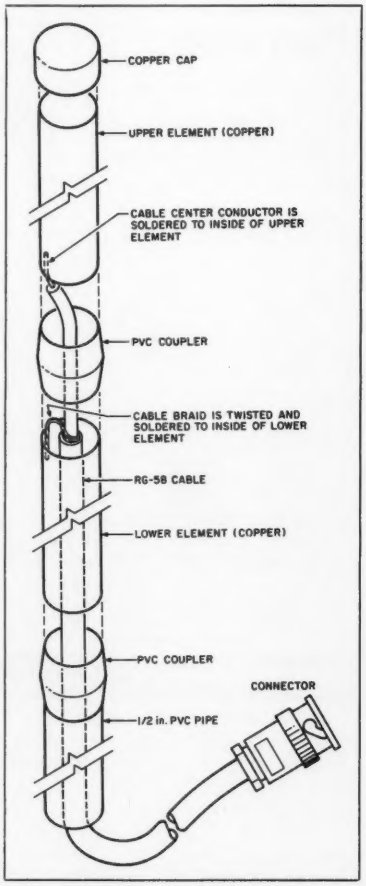
Tuning

You originally cut the copper to approximate lengths. Now you need to cut them to resonate at the frequency you intend to use most often.

Clamp the PVC tube to a suitable support, keeping the copper as far as possible from any objects which might reflect. Measure the SWR above and below the target frequency.

Using a tube cutter, remove about ¼-inch from the top element, then check the SWR. More copper will probably have to be removed. If so, it should be removed from the lower element this time.

Gently pull the lower tube from the coupler and cut the same amount from the lower tube that you removed from the upper tube. If there is a connector on the feedline, the waste copper ring will not slide off, so cut the ring of copper with a pair of diagonal cutters. Reassemble the antenna and check the SWR.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RG-58 CABLE
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PVC COUPLER
CONNECTOR
1/2 in. PVC PIPE

Figure 1. The end-fed dipole.

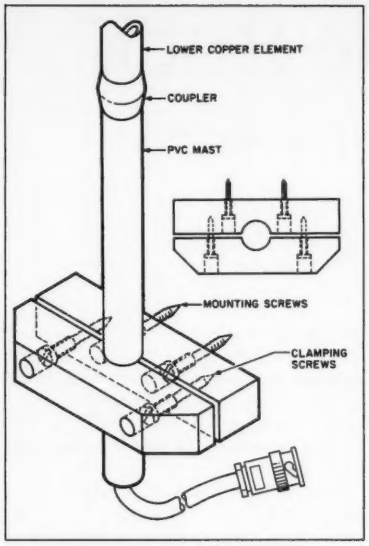


Figure 2. Detail of the clamp

Repeat this process as many times as necessary to obtain the lowest SWR. If you are working inside a building you may not get lower than 1.5:1 until the antenna is mounted outside.

If you cut too much copper from the antenna (this almost always happens) install the copper pipe cap on the upper element. The cap will fit tightly, and can be adjusted vertically for the lowest SWR.

Pretty Work

Once the antenna is working properly, solder the copper cap to the upper element. Pull the copper tubes apart and apply a liberal amount of cement to the couplers. Reassemble the components, making sure the tubes are seated just as they were during tuning.

Place the assembly on a flat surface and roll it to reveal any misalignment. If it isn't straight, bend it gently until it rolls smoothly, then allow the cement to dry for at least four hours. Fill the bottom tube with caulk or similar material to relieve strain on the coax and keep the spiders out of your new project. When the cement has dried, install a BNC or PL259 connector on the coax (if it has not already been done). Sand the antenna lightly and paint it with enamel. Paint is necessary because the copper will corrode in time without protection.

Mounting

You probably won't be able to convince the spouse to hold your new antenna at arms length while you engage in a long conversation, so you will need to mount it somehow. The PVC pipe can be clamped to an upright member of nearly any material without affecting the performance, but keep metal objects at least eight inches from the elements.

I built a clamp for my antenna from a piece of scrap two-by-four. The clamp is screwed to a fascia board on the backside of the house. To make this clamp, cut a piece of two-by-four about five inches long (length isn't critical). Bore a ⅝-inch diameter hole through the middle with a paddle bit. Cut the board through the center line of the ⅝-inch hole. Drill and countersink two screw holes in each piece of wood to fit your installation. Make sure that the holes are offset because two of them hold the fixture and two hold the clamp. (See Figure 2.)

Holy Toledo! It Works!

You will notice an improvement in performance over a quarter-wave ground plane antenna while transmitting, and a huge improvement in reception. The reason for better reception may be due to the greater "capture area" afforded by the tubing.

Build a few more of these. The second one takes much less time than the first. ■

Components List

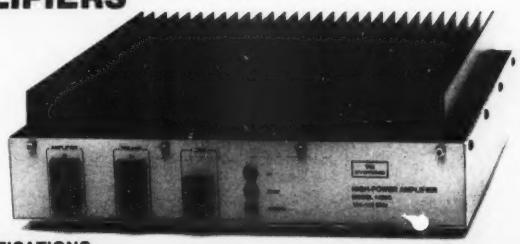
2 Quarter-wavelengths of ½-inch hard-copper pipe
  146 MHz: 19.23 inches
  222 MHz: 12.65 inches
  440 MHz: 6.38 inches
2 PVC couplers (the type used to join pipe end-to-end)
1 ½-inch PVC pipe, at least 12 inches long
1 ½-inch copper pipe cap
1 length of RG/58 coax

TE SYSTEMS

RF POWER AMPLIFIERS

NEW!

400 WATTS (144-148 MHz)



TE SYSTEMS new **HPA Series** of high power amplifiers now available through select national distributors.

All amplifiers are linear (all-mode), automatic T/R switching, and incorporate optional GaAs FET preamp. Amps are usable with a wide input drive level range. Thermal shutdown protection and remote control capability included. All units are designed to ICAS ratings and meet FCC part 97 regulations. Approx. size is 2.8 × 10 × 11.5″ and weight is 8 lbs.

Consult your local dealer or send directly for further product information.

SPECIFICATIONS

Model	Freq. MHz	Power Input	Power Output	Preamp NF-dB	Preamp Gain-dB	DC +Vdc	Power A	RF Conn.
0550G	50-54	10	400	.6	15	13.6	60	UHF
0552G	50-54	25	400	.6	15	13.6	55	UHF
1450G	144-148	10	400	.6	15	13.6	54	UHF
1452G	144-148	25	400	.6	15	13.6	50	UHF
2252G	220-225	25	220	.7	14	13.6	36	UHF
4450G	420-450	10	175	1.1	12	13.6	34	N
4452G	420-450	25	175	1.1	12	13.6	29	N

Models also available without GaAs FET preamp (delete G suffix on model #). All units cover full amateur band – specify 10 MHz bandwidth for 420-450 MHz amplifier. Continuous duty repeater amps also available.

Amplifier capabilities: 100-200 MHz, 225-400 MHz, 1-2 GHz, Military (28V), Commercial, etc. also available – consult factory.

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Los Angeles, CA 90025
(213) 478-0591

CIRCLE 232 ON READER SERVICE CARD

More BTUs for the Buck

Inexpensive alternative to industrial heat guns.

by David McLanahan WA1FHB

A heat gun is a valuable addition to any electronikker's tool box. Its primary use is to form heat-shrink tubing over wire connections to today's miniature sockets and plugs, and for in-line wire connections. A closely related use involves the melting of solder "preforms" for coaxial connector terminations and similar connections. Carefully used and properly baffled, a heat gun can even be used to remove soldered-in components. This is one of the recommended ways of dealing with the new "flat pack" integrated circuits raging through electronic products these days.

The problem for amateurs is that we really need a product that is available only through industrial channels and at industrial prices—in the neighborhood of $100. The more frugal of us have played with electric hair dryers, only to find that their temperatures are too low, and that they are composed of materials and safety features (per the Underwriters Laboratory specifications) that make higher temperatures difficult to attain.

Hot Enough For You

Enter the consumer-oriented "paint stripping gun," a cheap ($20–30) discount store device capable of generating the temperatures we need. For example, the Black & Decker 9751 paint stripping gun is said (by the manufacturer) to give temperatures of 730–830 degrees Fahrenheit. It is available for as little as $19 at your local discount store. This price, however, does NOT include the necessary heat-guidance accessories that are sold separately. I've been trying to buy these guides for several months without success. A number of discount stores in my area sell the guns almost by the cord (a measure usually applied to firewood), but the friendly neighborhood discounters gave me blank looks when I asked about the little formed sheet metal heat guides that the box represents as "optional accessories."

Finally, I journeyed over to one of the primary heat gun sources—a Black & Decker Company store in Maine. Amazingly, they not only didn't carry the recommended accessories, but they weren't even able to furnish prices and ordering information! They did give me, however, a list of "Company-Owned Service Centers" and told me to write (or call) one of them to find out how to get the little stamped metal parts we needed.

Get 'em Locally Made

These heat guides can be locally fabricated, but there are two caveats. First, common (unprotected) rolled steel may rust after the protective oil coating is burned away; second, galvanized sheet metal may be hazardous, since it liberates zinc vapor at high temperatures. Even if I do manage to get the B&D shield kit, I'm sure they will have to be bent a bit for electronic use, but that is probably easier than starting from scratch. Going to the local metal works shop, however, can be an inexpensive route, and allows you to get heat guides custom-made.

In Closing

Just remember, please, that heat gun temperatures are capable of causing serious (and painful) burns as well as starting fires. Do *not* confuse a heat gun with the normal hair dryer it closely resembles. It MUST be used with great care!

No matter how you solve the heat-guidance problem, the paint stripper gun is a good, inexpensive alternative to a costly but useful electronic tool.

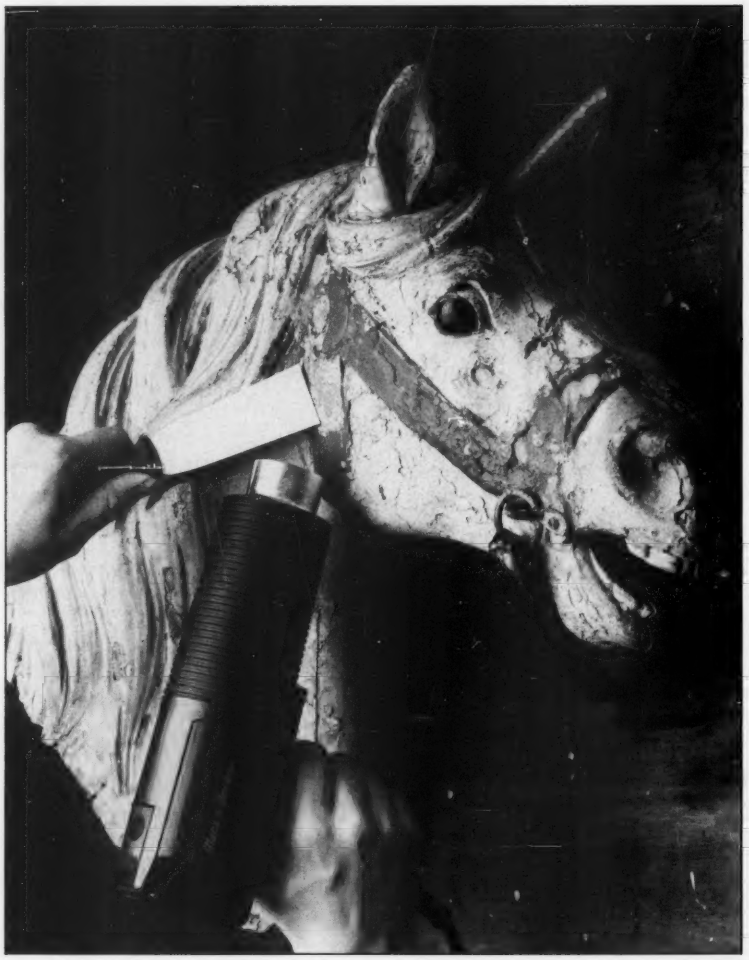


Photo A. The B&W paint stripper gun. Have your own heat guide made at a local metal shop and voila!—a cheap alternative to the industrial heat gun.

10 Meter Base Station Antenna

Ready in two hours!

by Russ Stein WA6ZOS

Recently I converted a Hy-Gain CB board to 10 meters FM. I had heard about the growing activity on 10 meters, and I wanted to investigate it for myself. After the low-cost conversion, I needed an antenna to give my new 10 meter FM equipment a fair chance. I was interested not only in working distant stations on skip, but also in local ground-wave communications. A vertical antenna with a low radiation angle would be ideal.

Antenna Design

I had read that antennas manufactured for the CB market could easily be tuned for 10 meters. Unfortunately, I found no local source for new or used CB antennas. I knew I had to build one, but I needed to come up with a mechanically simple design. My first ideas revolved around the regular ground-plane antenna, with radials at the base. This proved to be too mechanically involved, so I examined a coaxial dipole, which promised to be more mechanically convenient.

The feedpoint impedance of this type of antenna is closer to 75 than 50 ohms, but on 10 meters the losses due to this mismatch would be negligible.

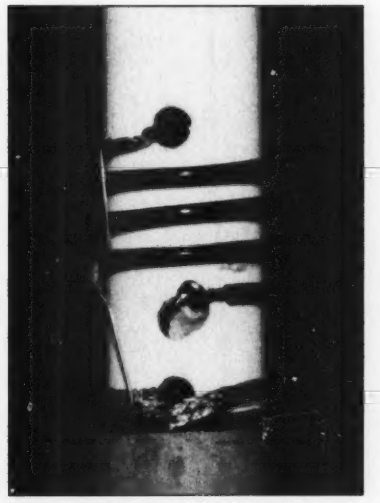


Photo A. Wrap the wire around the pipe, extending upward about an inch from the hole where the center conductor exits. Note the position of the 47 pF disc capacitor. The PVC pipe fits snugly inside the TV mast.

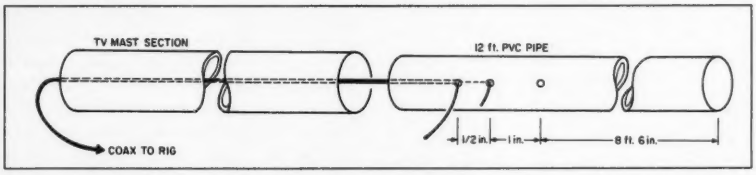


Figure 1. Snake the prepared end of the cable up through the TV mast section. Pull the braid through the first hole and the center conductor through the second.

The coaxial dipole seemed the best choice, so I set out to build one. I calculated the dipole, at 29 MHz, to be about 17 feet long. I found enough materials on hand to construct the antenna. For the coaxial part of the dipole, I used an old 10-foot TV mast section. Leftover Sch. 40 PVC sprinkler pipe provided support for the antenna's vertical radiator. For the latter, I used #14 solid insulated wire. To keep water out, I used a PVC end cap.

Ready for Testing in Two Hours

The antenna was very easy to build, and in about two hours I had it mounted on the roof of my single-story house. The SWR was about 2:1 at 29.6 MHz and increased to over 2.5:1 at 29.0 MHz. At 29 MHz, the feedline losses would not make a sizable difference in system performance, but would my solid state transmitter be able to handle the mismatch?

The transmitter tolerated the high SWR, but it put less power into the feedline than into a 50 ohm load. I decided to use the antenna to see how it would perform. The band was open and active, so I began calling CQ with my 3 watt "peanut whistle," on the chance I might make a contact.

The results were amazing. In a few hours I had worked stations in Texas, Mississippi, Illinois, Minnesota, New York, Florida, and Wisconsin, as well as a couple of local California stations, one 30 miles distant. Signal reports were very good, and I was pleased with how well the antenna worked.

Ten meter FM was so much fun, I left the antenna as it was for several weeks and just enjoyed myself. It was clear that this antenna design worked well, but I wanted to correct the impedance mismatch so I could run more power. This proved to be relatively easy to do by adding a simple LC matching network. After the change, the antenna had an SWR of 1.2:1 at 29.6 MHz, where I tuned it for lowest SWR, and it increased to only 1.5:1 at 29.0 MHz.

Construction Details

First, obtain a 10-foot metal mast. Using a hacksaw, cut it to 8' 6" in length. Use sandpaper to roughen and clean the inside, where you made the cut. Starting at the bottom, snake your feedline, RG-58/U or RG-8X, through the mast section. Cut six inches of insulation off of the coax and separate the braid from the center conductor. Cut the center conductor 1-½" long, and remove ¼" of insulation.

Next, obtain a 10-foot section of PVC pipe. Measure 8'6" from one end of the PVC pipe, and drill three holes with a ¼" drill. (See Figure 1.) Snake the prepared end of the cable up from the end of the PVC pipe closest to the holes, with the braid coming out the first hole, and the center conductor coming out the second hole. I found it helpful to insert a piece of small-gauge solid hook-up wire through each of the two lower holes and out of the mast end, then solder one to the braid and one to the center conductor. This allows you to pull the cable up inside the mast with the two parts of the cable coming out the correct holes. Use the same method to pull the #14 solid wire from the far end of the pipe and out through the last hole.

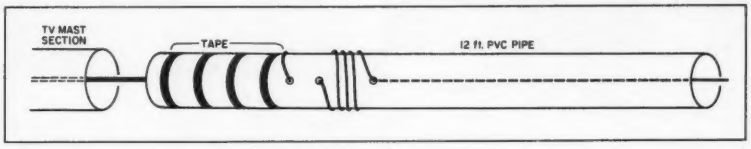
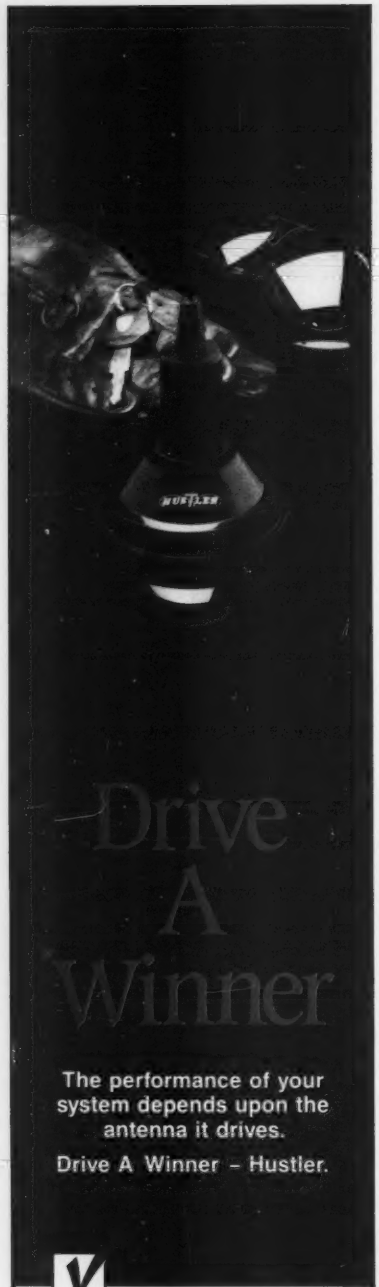


Figure 2. Connecting the TV mast to the PVC pipe.



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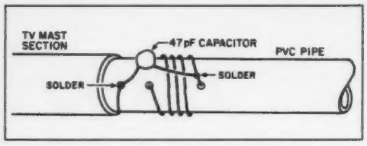

Figure 3. Position of the capacitor.

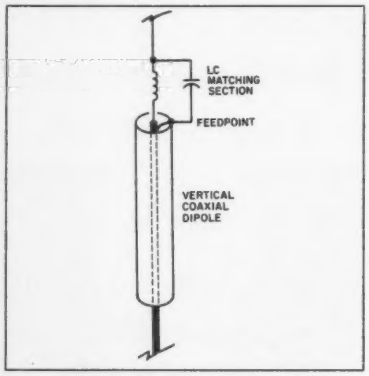

Figure 4. The vertical, coaxial dipole.

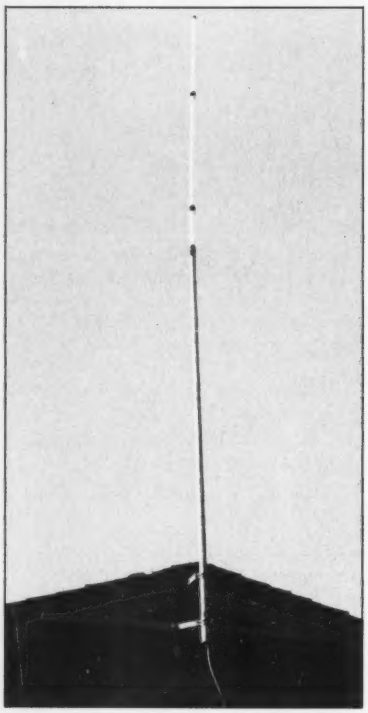

Photo B. A trim, inconspicuous, but hot performer. Notice the connectors between the pieces of PVC pipe.

Leave about six inches of extra wire at the end of the pipe, where the #14 wire exits the hole. Remove a section of insulation about ¼" long, and tin the bare section. Then wrap the wire around the pipe for four turns, evenly spacing it over the 1" of pipe to the middle hole, where the coax center conductor exits the pipe. (See Photo A.)

Remove the insulation from the end of the #14 wire, solder the wire to the coax center conductor, and tape the connection. Wind tape over the four coil turns to hold them in place, but don't cover the exposed bare wire section near the hole. Prepare the end of the PVC pipe nearest to the holes by wrapping it with four or five thicknesses of electrical tape one tape-width. Use just enough to fit it snugly inside the metal mast section.

Next, wrap one tape-width every six inches or so, up to six inches below where the coax braid comes out. Just below this, wrap three turns of electrical tape, one tape-width.

Insert the end of the PVC pipe into the metal mast section until you get to the last wrap of tape near the braid. Now, wrap the braid around the pipe and sandwich it in between the tape and the inside of the mast. Make sure the braid is in tight contact with the mast, then securely tape the junction of mast and PVC pipe. Drill a hole in the center of the PVC end cap just large enough for the #14 wire radiator.

At the end of the PVC pipe where the #14 wire comes out, push it through the hole in the cap, then seat the cap on the end of the pipe. Pull on the #14 wire to be sure it is straight inside the pipe, and bend it back down over the cap. Cut the wire so only about an inch extends down the side of the end cap. Tape the entire end cap to secure the wire and to seal against moisture.

The antenna is now complete, except for the addition of the 47 pF disc capacitor. (You could also use a 100 pF mica trimmer instead, to tune precisely for lowest SWR.) You will need to solder the capacitor from the bare section of wire radiator where it comes out of the pipe to the braid of the coax (see Figure 3). Wrap the PVC pipe with tape from where it joins the mast section to an inch or so to the other side of the last hole. You may want to use a weather sealer, such as Scotchkote® over the tape for better weather protection. You can mount the antenna with regular TV mast hardware. Since the mast is part of the dipole, mounting should be on non-metal surfaces, or you can use insulators, if needed. The antenna performs best with the feedpoint 16 feet or more above ground.

I've been using this antenna at 100 watts with absolutely no problems. Its performance has been impressive. Considering the low-cost and easy construction, this hot performer for 10 meter FM is is hard to beat. Why not put one together and enjoy? See you on 29.6! 73

Russ Stein WA6ZOS, 7593 Frederiksen Ct., Dublin CA 94568, has been a licensed ham since 1966. He is currently the Communications Technician Supervisor with the City of Berkeley, and is responsible for the design of radio, telephone, alarm, and computer systems, as well as their installation and maintenance.

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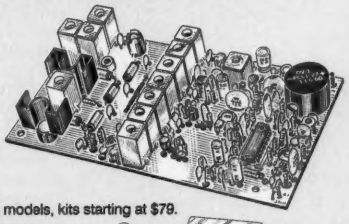

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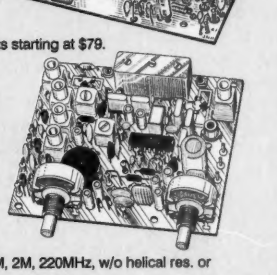

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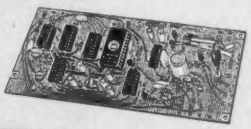

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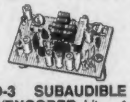

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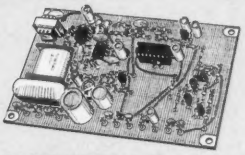

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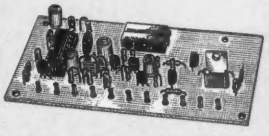

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CIRCLE 57 ON READER SERVICE CARD

Solution: AGC

A circuit with wide applications.

by Fred Baumgartner KA9NEH

One of the neatest things to come along in ham gear is hands-free operation. I like to work while I operate, which means I have a nasty tendency to back too far away from the mike. My other operating habit involves 2 meters and a noisy old car. Drives me nuts having to adjust the volume as different stations with different deviations and mike habits check in.

The solution is an automatic gain control (AGC). This generic building block answers a million needs.

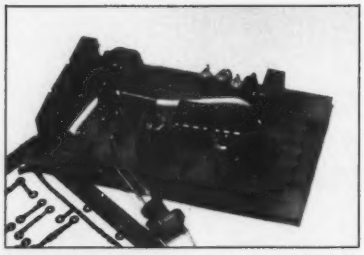

Photo. The AGC circuit is simple and useful.

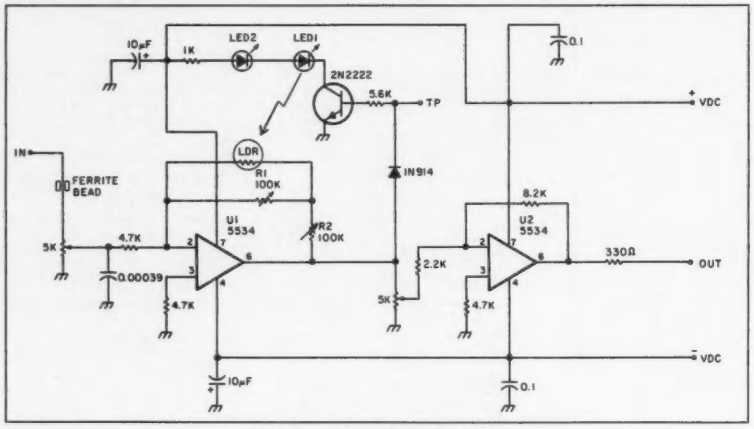

Figure 1. Circuit for the AGC.

What is an AGC?

An AGC is an amplifier with control over its gain. The gain is varied as the input changes. If it is very rapid (fast as a cycle of the input), the device becomes a compressor. Compressors serve useful functions; they control noise and increase modulation density, which allows maximum modulation and lowest noise floor. This is important when communicating in a very noisy channel.

If the input is slower, the AGC only averages out the audio level to make it more or less the same. If an actual compressor is used, an AGC would go before it. The AGC is then used to control the audio level before major "processing" is applied.

Operational Amplifiers

Op amps make it easy to design all sorts of amps and signal processing units without having to worry about the internal dynamics of the amplifier itself. This is why I have chosen to use them. In Figure 1., you can see that I use two amplifiers. The first is the gain control element itself and the second is an output buffer. If you want to take a microphone level input, you need a microphone-to-line level amplifier ahead of the AGC. If a microphone level output is required, you need a dropping pad on the output.

The gain control amplifier is a simple op amp with a variable resistance in the feedback loop. This resistance is keyed to the output of the amplifier. The control element is a CdS cell, available for pennies from your local Radio Shack. This is tied to an LED; as the output from the amplifier rises, the LED lights and reduces the resistance in the feedback loop, which consequently reduces the gain.

Potentiometers

There are four pots on the AGC board. The first controls the input level. It allows you to set the input in the middle of the active AGC range.

Two pots control the characteristics of the AGC. The pot in series with the CdS cell sets the minimum gain of the device. At minimum resistance, it has minimum gain under full input and maximum AGC control. The pot parallel to the CdS cell restricts the maximum gain of the stage. At minimum resistance, the AGC is at minimum gain and there is no AGC action. At maximum resistance, the AGC has the most control.

The three pots can be set to control the characteristics of the AGC amps. With the AGC working hard, any input from +20 dB to −30 dB comes out at about 0 dB. See Figure 4. In most communications circuits, this will also bring noise up to average levels. This ability is a bit much, so the controls

Parts List

Qty	Description
2	100k potentiometer, R1 & R2
2	5k potentiometer
2	red Light Emitting Diode, LED1 & LED 2
1	1N914 diode
1	2N2222 transistor
2	10 µF electrolytic capacitor
2	0.1 µF capacitor
1	0.00039 µF capacitor
1	8.2k ¼W resistor
1	5.6k ¼W resistor
3	4.7k ¼W resistor
1	2.2k ¼W resistor
1	1.0k ¼W resistor
1	330 ohm ¼W resistor
1	Ferrite Bead
2	NE5534 op amp IC, U1 & U2
1	CdS photo resistor, LDR

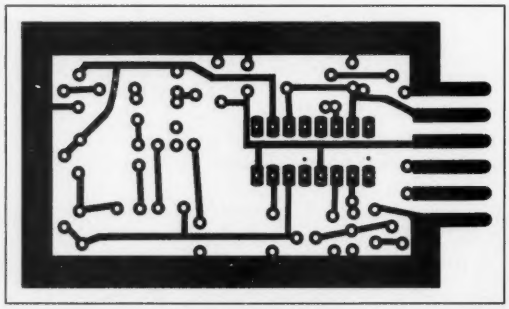

Figure 2. Foil diagram.

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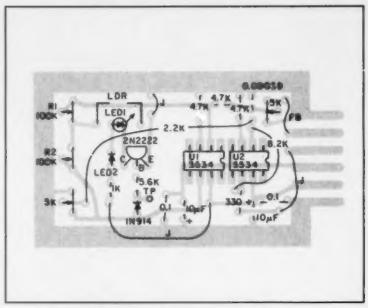

Figure 3. Parts placement diagram.

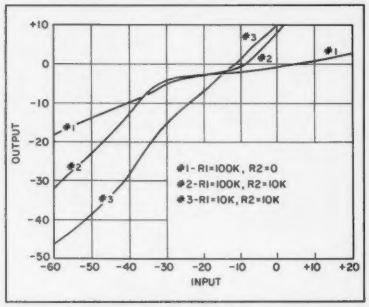

Figure 4. Three pots control the characteristics of the AGC amps.

allow you to reduce the range of the AGC.

The fourth pot controls the output level. This convenience makes matching the next stage easier.

Versatile Applications

The small PC board fits easily in most units. Any sane construction method, however, will work. The two 5534 op amps are put in one 16-pin socket. The CdS cell is superglued to a standard red LED with the top portion filed flat, almost to the LED junction. Optical coupling is pretty tight. The CdS cell/LED needs to be light-tight. I dip it in black paint then wrap it in black electrical tape. If light gets into the CdS cell, it will reduce the amplifier gain the same as if a strong audio signal had been applied.

It's best if the power supply is ±15 volts, but even at ±5 volts, the device performs rather well. When the series LED (identical to the one on the CdS cell) is visible, significant gain reduction is occurring.

A setup using the regular audio is most often ideal.

One of the results of the low parts count and easy to obtain parts is a certain amount of distortion. At about 1% it would just begin to be heard in a good stereo system, but not even close to noticeable in a communications circuit.

The uses for the circuit are endless—phone lines, phone patches, recorders, and so forth. 73

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Make Your Own Circuit Boards

The reliable method.

by Hugh Wells W6WTU

The increasing complexity of electronic circuits requires construction on printed circuit board material. Over the years, many techniques have been developed for making boards quickly and efficiently. Unfortunately, the new ways have left the project-oriented ham way behind because not all of the processes are readily available.

To answer the ham's need to be able to make neat, functional and reliable boards, I present the following process. In some respects, the process is archaic and slow, but it is effective, repeatable and reliable. It supports both single- and double-sided boards. Most of all, the process is easily within the reach of all project builders, and materials are available from local distributors. All of the materials you need are shown in Photo A, except for chemicals and drill bits.

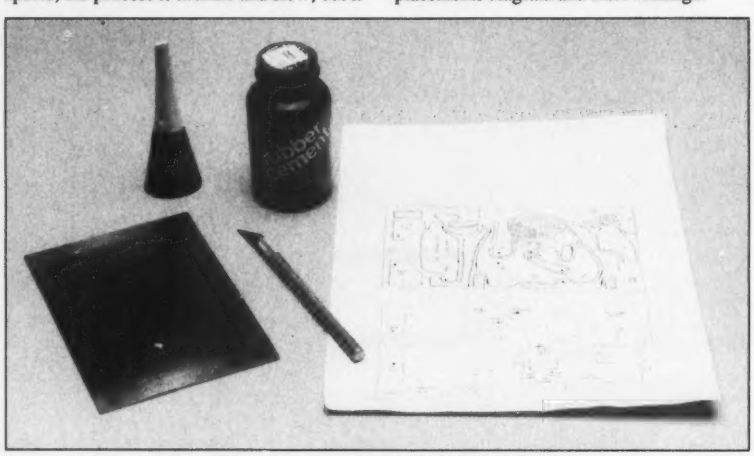

Photo A. Materials used in the board-making process.

Caveat

Speaking of chemicals, copper etchants, new or used, are bad actors! If you have kids, pets, or even just an absent-minded nature, be careful how you store, use, and dispose of etchant or etchant-contaminated materials!

In this process, you simply use white bond paper as a mask while you apply an etch resist. The mask is removed after the etch resist has dried. You complete the board with normal etching and drilling.

Preparing a Mask

Begin by photocopying the circuit pattern onto white paper. The 1:1 size ratio is important, but white-to-black contrast is not. Make two or three copies as a backup for goofs, and in case you want to use one later for another project. The process is also suitable for an original design which has not previously been traced. Make a rough layout of the parts and wiring while working out a suitable parts placements diagram and trace routings.

Remember that during layout, all parts must be viewed from the bottom (trace side). Also, during trace layout, consider leaving as much copper on the board as possible. Wide copper traces exhibit low resistance, are easily inspected, and will save the life of the etchant. One philosophy is that copper, once removed from the board, cannot easily be replaced. Therefore, take off only the amount required to make the circuit functional. The final layout of the trace pattern is made on white bond paper. Preserve the original and make a 1:1 ratio photocopy, since the mask is destroyed during the board-making process.

Following the layout of the trace, you should make a parts placement (or stuffing) diagram. Parts placement is viewed from the top of the board (opposite of the trace side).

Preparing the Board

Select the board material and cut it close to the finished size. The first time you use this process, I advise that you make the board over-large by 1/16 to ⅛ inch. The extra size will accommodate errors in mask alignment.

After cutting the board to size, smooth the edges with a file or stone. Next, polish the copper with fine steel wool to remove dirt and oxides. Rinsing the board with alcohol or lacquer thinner will remove oil and fingerprints. Hold the cleaned board by its edges.

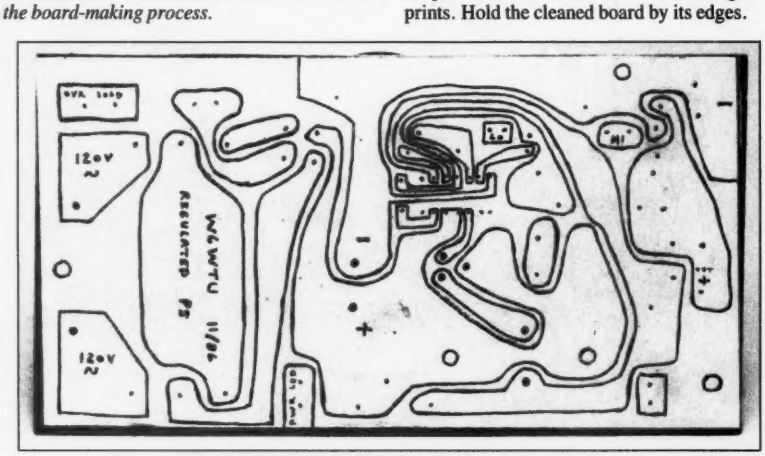

Photo B. Trace pattern rubber-cemented to the board.

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I am in need of schematics and service info for the Allied A-2516 ham band receiver. Also, schematic for ELCO 715 power/SWR checker. Will pay any copying costs, etc. *Jon Danford KAØSOV, 2115 Joplin Ave., Joplin MO 64804.*

I would like to hear from anyone who has successfully applied amateur radio, cellular telephone or satellite relay equipment for reliable phone patch communications from kayaks or small boats in remote waters, e.g., Baja California or Tierra del Fuego, South America. *Keith R. Higgins WA6IYL, PO Box 306, Lakewood CA 90714.*

Need service manual and schematics diagram for the SWAN/CIR Astro 200A PLL, all solid state transceiver. Will pay copy and postage charge. Call *(606) 573–7844* after 2100Z, *or send QSL with quote to* Patrick Benesch N4MSQ, Gen. Del., Loyall KY 40854.

I need schematics and/or manuals for a Dana Model 4700 digital voltmeter and for a Dana Model 8020B (with option 200) frequency counter. I will purchase or copy. Please send a postcard first. Thanks. Brian Gillam N4KDF, RT 3 Box 607, Appomattox VA 24522.

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CA-2X4SR	146 MHz 446 MHz	3.8dB 6.2dB	150W	3'4"	MOBILE
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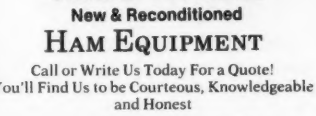

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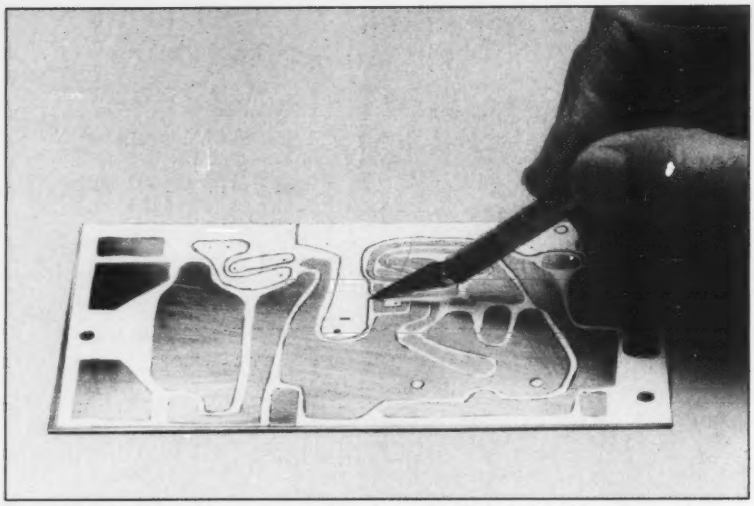

Photo C. Cutting the trace pattern from the mask with the knife held at a low angle.

Transferring the Pattern

Apply rubber cement to the copper on the board and to the back side of the paper mask (opposite the trace side). The rubber cement must be spread thin to eliminate lumps, but the whole surface must be covered to prevent voids. While the rubber cement is still slightly tacky, position the paper mask over the copper without touching, and align the paper to the board. Lower the paper and make contact, preferably at the center of the board. Press the paper down against the board, rubbing from the center toward the edges to remove bubbles.

If wrinkles occur in the paper, you will have to decide whether to use the trace as-is or start over from scratch. Sometimes it is possible to lift an edge of the paper to remove a wrinkle. When lifted, you will have to add rubber cement to the exposed copper, then rub the paper down flat. Any paper hanging over the edge of the board should be cut flush using scissors or a sharp knife. Photo B shows the paper trace cemented to the board.

Wait a few minutes for the cement to dry, then transfer the trace to the copper. Mark the spots for drilling holes with a sharply pointed instrument such as a scribe or sharpened nail. Hold the pointed instrument vertical to the board and press hard enough to make a small dimple in the copper. *Copper dimples easily.* The purpose of the dimple is to identify each drilling location after the board is etched. Before you begin marking, practice dimpling on a piece of scrap board so that you can determine the amount of pressure you require.

Using a sharp knife, cut the paper along the edge of a circuit trace, as shown in Photo C. Hold the knife at a very low angle to prevent pulling and tearing of the paper. Bear down lightly—you want to cut only the paper, not the copper. Don't worry about some creasing of the copper. Try to cut along the entire trace line back to the beginning point without lifting the blade. Lifting the blade and starting another cut along the same line may cause a paper burr. After the trace has been cut completely along all edges, lift one end of the paper trace and remove it from the board, exposing the copper. Watch for uncut paper fibers, and cut them off during the paper trace lift-off to prevent lifting of the adjacent mask.

The exposed copper is the circuit trace you want to save. Continue cutting and removing the paper trace pattern until all of the copper trace is exposed. Inspect the copper trace for cutting errors, paper burrs, and rubber cement. You may correct errors at this point.

Remove paper burrs with the knife blade. Remove spots of rubber cement by rolling a ball of dried rubber cement over them, or by wiping them with a soft rubber pencil eraser. You can correct cutting errors, such as a torn or lifted mask, during the application of resist material. Paint the adjacent copper trace with resist to hold the mask in place. Repair any resist running under the partially lifted mask after the mask is removed.

Applying Resist

Resist is any material that protects the copper during the etching process. The etch removes all exposed copper not covered by the resist. Any material capable of rejecting water will work as a resist. Fingernail polish and lacquer-based paint have proven to be excellent resist materials. Fingernail polish is applied with the brush from the bottle, and lacquer may be brushed or sprayed on. Spraying, although faster than brushing, tends to cause small voids in the resist, making it less desirable than brushing.

Apply the resist material directly onto the exposed copper where the paper trace was removed (see Photo D). To facilitate paper mask removal, confine the resist to the trace area and keep it off of the paper as much as possible. Allow the resist to dry completely, and then carefully remove all the remaining paper mask. Once all of the paper mask is removed, inspect the bare copper for resist material between traces.

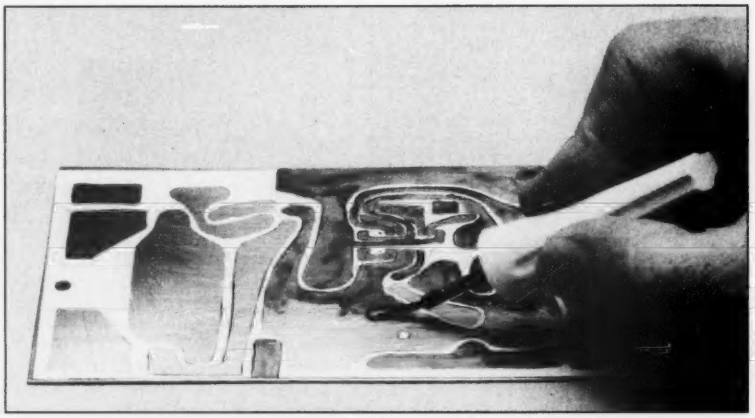

Photo D. Applying the etch resist on the copper with a brush.

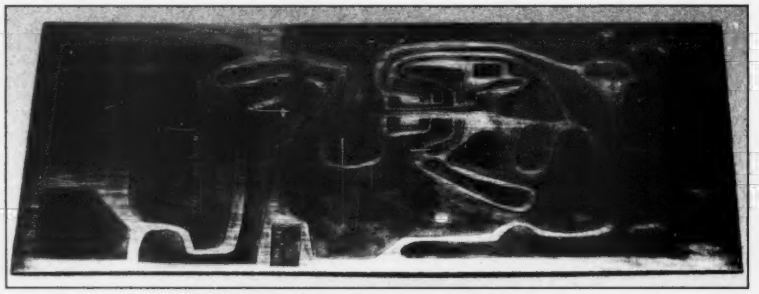

Photo E. Etch resist on the board with the mask removed.

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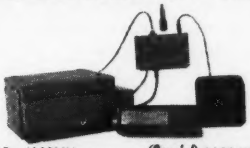

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Photo F. The completed board after etching, drilling, and solder coating.

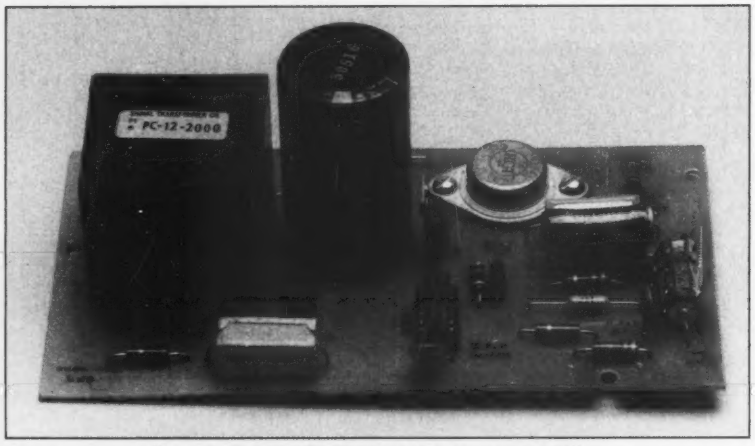

Photo G. The completed project after component stuffing.

The exposed copper will be removed during etching. A bright light and magnifying glass are great aids for inspection. Correct bridging by cutting the resist and scraping it away. Because of the narrow spacing, run the knife blade between IC pads as a precaution against shorts. Make trace opens, add a trace, or correct an error by brushing resist onto the copper as needed. After the resist has hardened, cut and scrape the resist with the knife to obtain the final trace pattern and spacing.

Marking the Board

Many times it is desirable to identify terminals and voltage points on the board. Before etching, the marks may be scratched into the resist with the scribe after the resist has dried. Any scribe marks placed on the bare copper will be lost during etching. Where room is available, a patch of resist may be placed on the copper and the marks scribed into it. The copper must show through the scribe marks in the resist to be etched. Photo E shows the board ready for etching.

You may also use a black marking pen, since the ink contains enough water-resistant material to restrict etching. Take care with this, however, since the ink from many resist pens tends to break down and become porous during exposure to ferric chloride etchant, making the ink unsuitable as a reliable trace resist. Of course, after the board has been etched, you can use the marking pen on the component side of the board to identify part polarity and location.

Finishing the Board

You may etch the board after the resist is dry, about half an hour after it is applied. Trace smearing may occur during handling if you rush too much.

Many techniques have been developed for etching printed circuit boards, any one of which is satisfactory. However, a simple and easy technique is to pour ferric chloride into a plastic or glass tray to a depth of about ¼ inch. Float the board, copper side down, on the surface of the etch. If you use green Fiberglas™ board material, you can observe the etching process through the board. You may have to lift one edge of the board occasionally to purge trapped bubbles.

When the process appears complete, remove the board, wash it with tap water, dry it with a paper towel, and inspect it. If the etching is incomplete, float the board again. When you use a wide trace pattern, you don't have to worry about over-etching. The heat from a small incandescent lamp, close to the etch, will speed up the etching process.

Another suitable technique for etching uses a zipper top clear plastic bag as an etch container. Place the board in the bag and pour about one inch of etch on top of it. After sealing the top, lay the bag flat, with the copper facing down. Gently moving the bag will displace bubbles. You can inspect the board through the plastic any time during the etching process. Take care to prevent leaks in the bag.

Materials Needed for PC Board Etching

Copy of the circuit trace (actual size).
Fingernail polish or lacquer paint (any color other than clear).
X-acto knife or equivalent with a pointed blade.
Rubber cement for paper use only.
Printed circuit board material cut to size (single or double sided, as required).
Sharp scribe or pointed nail.
Fine steel wool (clean and oil free).
Lacquer thinner or acetone.
PC board drills #57 and #62, or as required.
Copper etchant (ferric chloride or equivalent).

Procedure Summary

1. Prepare a 1:1 ratio copy of the circuit trace.
2. Clean the copper on the board.
3. Coat both the paper mask and the copper with rubber cement.
4. Align the paper to the board, press down and rub from the center to the edges.
5. Indent the hole locations with a scribe.
6. Cut along the trace lines with a knife held at a very shallow angle.
7. Remove the paper in the area of the trace. Repeat steps 6 and 7 until all the copper trace is exposed.
8. Inspect the exposed copper.
9. Paint the copper with fingernail polish or lacquer. Attempt to keep the paint inside the trace area.
10. Allow the paint to dry.
11. Remove the remaining paper mask.
12. Inspect and repair the trace pattern.
13. Etch the copper.
14. Remove the resist.
15. Drill and clean the board.
16. Solder coat the trace.
17. Install the components.

After the etching process is complete, remove the resist with a solvent such as lacquer thinner, acetone, or nail polish remover. A small amount of solvent on a paper tissue will clean the board. With the resist removed, the board is ready for drilling. After drilling, clean the board with steel wool and solvent before stuffing and soldering components.

Hole sizes are a matter of personal choice and application. I suggest the following drill sizes as a guide: #57 drill for ½ watt resistor leads and jumper wires; #62 drill for IC pins, transistor leads, and ¼-⅛ watt resistor leads.

Solder Coating

After etching you may wish to add a solder finish to the copper trace. The advantages are better solder-ability, uniform appearance, and reduced copper oxidation. To solder coat the board, you must first clean it with fine steel wool and a solvent.

To solder-coat the board: 1) Coat the copper with rosin flux; 2) Place a small drop of solder on the flat tip of a 25–30 watt soidering iron; 3) Touch the solder to the copper and draw the iron across the copper, leaving a solder trail and adding small amounts of solder from time to time; 4) Continue drawing solder over all of the exposed copper until it is uniformly coated; 5) Clean the coated board with solvent to remove the flux. CAUTION: Move the iron rather rapidly to prevent burning the board or lifting the copper. Practice the coating process on a scrap board to work out the technique.

Photo F shows the board after it has been etched, drilled, and solder-coated. Photo G shows the board after it has been stuffed with parts.

Double-Sided Boards

You can make double-sided boards using this same process. However, you must take care to preserve registration of the two sides. The trace patterns for both sides must be registered to each other with keying targets or marks before you start the process. Otherwise, the second side will need trace adjustments.

Prepare the first side of the board as you would for a single-sided board. I suggest that the first side be the more complex trace pattern. You may have to adjust the second side to accommodate the registration.

Rubber-cement the first trace pattern onto the board and allow the cement to dry. Cut the trace pattern as for a single sided board and add the resist material. When you've finished the first trace transfer, turn the board over and cover the second side with resist. Next, etch the first side, then remove the resist from the second side. The resist may remain on the first side if you want, but inspection of the trace must not be inhibited by the presence of resist.

Drill small holes through the registration marks to provide keying for the second side trace registration. Insert wire pins through the registration holes and stabilize them with resist. Prepare the trace pattern for the second side. Prick the registration marks in the mask to provide easy access for the pins. Coat only the back side of the paper mask with rubber cement. Place the mask onto the pins, but do not press it against the board. Hold the board by its edges and inspect the two sides for trace orientation. Lift the paper mask off the board as far as possible and coat the copper with rubber cement. Starting in the middle of the mask, press the mask down against the board and rub outward. Allow the cement to dry completely, and again inspect for orientation.

If in doubt about registration, drill two or three component holes through the board from the first side. If the hole locations have a close match by landing on the desired solder pads, then proceed with the trace transfer on the second side. However, if second-side trace adjustments are required, drill all of the holes through the board from the first side. Using a pencil, mark the trace adjustments corresponding to the hole positions onto the paper mask. Proceed with the trace transfer and resist application. Before you etch the second side, you will have to re-coat the first side of the board with resist to cover scratches and exposed trace edges. Etch the second side, then remove the resist from both sides.

Double-sided boards usually require plated through-holes for making circuit connections from one side of the board to the other. In lieu of plating the holes, when room on the board permits, you can add registered pads to each side of the board to accommodate a jumper wire. If the board was designed for plated through-holes, and plating is not available, you will have to solder every component lead on both the top and bottom side of the board to provide the through connection. 73

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Carole Perry WB2MGP
P.O. Box 131646
Staten Island NY 10313-0006

Marketing Our Hobby

Amateur radio is a dynamic, multi-faceted hobby and service. As such, it is comprised of many factions and special interest groups. This is as it should be. Any organization that wishes to grow and expand its horizons must always pay attention to its component parts and to move forward in a way that best serves the interests of the whole entity.

The one issue that I feel should be of concern to **all** special interest groups in amateur radio is that of growth and expansion. "Growth" in the sense of increasing our membership, and "expansion" in the sense of all of us being receptive to new ideas and approaches.

We have so much to offer people . . . if only they knew it! I have often sat in a Burger King or a McDonald's and wondered why local ham clubs weren't advertising (for free in most cases) their willingness to go into a local school for a demo, or the fact that they were conducting license classes.

I have never gone to a ham convention where I didn't make a mental note to myself to scream at someone for not tapping the very obvious segment of the population of attendees called "spouses." There's probably not a male ham radio operator reading this who at one time or another hasn't forced, begged, cajoled or bribed his wife to "just get a license." Wouldn't it be nice if at a convention we could offer a weekend introductory course on "How to Surprise Your Spouse and Get a Ticket"? Perhaps we'd see large numbers of women attending a convenient workshop which could offer practical help on how to get started and what to do next in a non-threatening (translation: no husband being present) environment. How many husbands could really successfully teach their wives how to drive? Let's not leave ham radio motivation and instruction in their otherwise very capable hands, either. Let's send the ladies to workshops conducted by professionals. Let's get well-trained instructors who can best encourage them and show them how much fun it can be—especially when they surprise the "old man." We need some good marketing efforts here. Just think: If it's successful, we'll be doubling the number of hams in the family—not to mention eliminating the need to have "How to Care for Your Petunias" forums at conventions.

Helping People Find Us

I can let my fingers do the walking through the Yellow Pages to find most things I'm looking for. Why can't someone find out where the nearest ham radio club is located by doing the same thing?

I feel that all the dialogue about the no-code license and the license restructuring is addressing the cart first rather than the horse. I'd love to see the '90s be the decade of a huge marketing and enlightenment effort on all our parts. We already know that what we've got here is pretty terrific; now let's tell the rest of the world about it. Good sound marketing techniques are what we need.

My own best efforts and expertise are in the area of education. This is a wide-open, wonderfully fertile area in which to incorporate amateur radio. Having taught "Introduction to Amateur Radio" in a New York City school for nine years, I can tell you that the possibilities are as limitless as your imagination. We hope to use this column as a forum to encourage letters, requests and questions about using amateur radio in the classroom, about how to motivate young people, or perhaps to keep the general ham population aware of how they can all play a vital role in helping youngsters discover all that is so terrific about amateur radio.

All thoughtful questions and ideas are welcomed. Let's use this column as a resource to help each other. 73

Photo A. Dawn, Kevin KB2JNP, Carole WB2MGP and Mary KB2IGG.

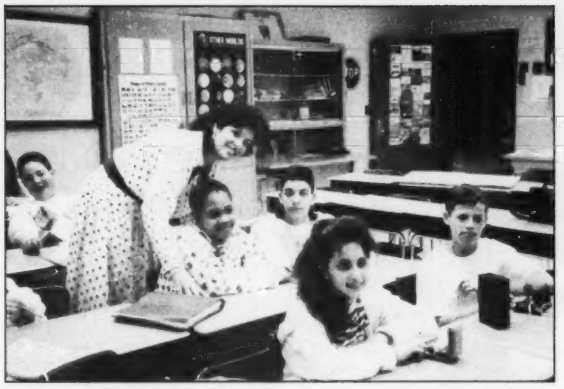

Photo B. Carole WB2MGP having some fun with the students in her ham radio class.

Carole Perry WB2MGP has been teaching "Introduction to Amateur Radio" at Intermediate School 72 in Staten Island, New York, for nine years. She is the creator of the curriculum currently being taught to sixth-, seventh- and eighth-graders. She is the president and founder of Media Mentors, Inc., the company that markets the curriculum package.

Carole received the prestigious 1987 Dayton Ham of the Year Award, the 1987 ARRL Professional Instructor of the Year Award and the 1987 CONEX (QCWA Northeast Chapters) Teacher of the Year Award. NASA Education Department selected her to attend a special Educator's Conference and a VIP viewing of the Space Shuttle Atlantis in April 1989.

Carole is also an ARRL Assistant Director in the Hudson Division and is Chairperson of the Hudson Division Educational Task Force. She is presently serving on the National Education Committee of QCWA. In 1988 she was selected to be an Educational Advisor to the ARRL Education Department.

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CIRCLE 145 ON READER SERVICE CARD

Build a Portable Mast Mount

A "spare" mount that's always ready.

by John R. Somers KC3YB

If you've ever tried to erect a temporary antenna on a mast under emergency or even Field Day conditions, or on a parking lot at a country fair, or in a roadside picnic area during a UHF opening, you will realize the need for this little mount. It's dirt cheap and small enough to keep in the car for whatever situations may arise, and it makes life so much easier!

The Need Exists

The problem with any antenna mast is that it won't just stand there by itself; it has to have something to hold it up. Normally this is accomplished by guy wires and anchors, but this solution isn't always convenient, or permissible, such as in the aforementioned parking lot. Besides, it seems that one of the main functions of guy wires, in most cases, is to trip people. What we need is something that will support an antenna mast unaided. Something that will always be close at hand.

While rearranging the trunk of my car one day, I realized just how heavy a spare tire and wheel are. The thought occurred to me that some type of mast support connected to the wheel would be easy to erect and more or less self-supporting. As the wheel already had bolt holes, my support could merely bolt in place when needed.

The Two-Minute Support

Using a couple of short lengths of 1¼" angle iron, I welded them together into a "T" shape positioned so that they would cover bolt holes in three places on the wheel. Then I welded an 18" piece of galvanized mast vertically to the tee. After aligning the assembly, I marked the location of the holes I needed, and and drilled three, using a ½" bit.

Photo. Once constructed, you can assemble this mobile mount for your antenna in about two minutes! Note that the wheel is positioned brake drum side up.

To hold the assembly together, I use 1½" bolts and wing nuts so I don't have to worry about carrying tools with me. When not in use, I keep the bolts, washers, and nuts attached to the mast support so I don't lose anything. When I need to use the mast, I can assemble it in a couple of minutes. I have found that the unit is more stable if I assemble it with the brake drum side (concave side) of the wheel up, which lowers the center of gravity.

A Starting Point

As I expected, how well the mast stands unguyed depends on which antenna is on top. I can generally attach a 2 meter collinear at the top of 20 feet of mast. Likewise for a small UHF array, while about fifteen feet is tops for a portable 2 meter beam. Obviously, wind has an effect as well. A guy ring attached near the top, with wires or ropes, will increase usable mast height and stability. Wire antennas, particularly inverted-V's, work well for this purpose.

For Field Day, you can interconnect several of these mounts with dipoles in between and slopers or guys on the ends. You can even use a small beam antenna, though it will definitely require guying. The advantage in this case, though, is the ease with which you can raise the mast assembly.

Although the mast support described above can be pressed into service in a number of ways, the important thing is that you can get your antenna up, and get on the air, quickly and without a whole lot of fuss. Sometimes, a few seconds saved can be important. 73

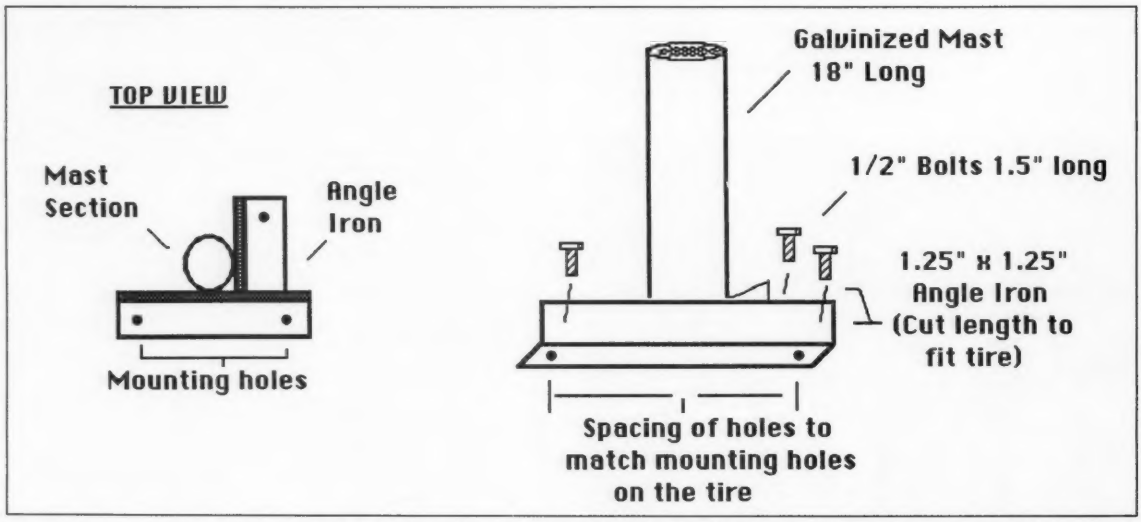
TOP VIEW
Mast Section
Angle Iron
Mounting holes
Galvinized Mast 18" Long
1/2" Bolts 1.5" long
1.25" x 1.25" Angle Iron (Cut length to fit tire)
Spacing of holes to match mounting holes on the tire

Figure. All you need are: two pieces of 1¼" x 1¼" angle iron (length to fit wheel); 3½" x 1½" hex head bolts; 3 ½" washers and wing nuts; and one piece of galvanized steel antenna mast.

73 Review

by Larry R. Antonuk WB9RRT

Fluke Model 87

A new digital multimeter from the 80 Series.

John Fluke Mfg. Co., Inc.
P.O. Box C9090
Everett WA 98206
(206) 347-6100
Price Class: $290

In late 1983, the Fluke Manufacturing Company rocked the electronics world with the introduction of the 70 Series of digital multimeters. The top-of-the line, Model 77, was the first handheld to have both digital and analog readouts.

It was tough, easy-to-use, small, and even had a "memory." It would remember the last reading it took–handy if you were using it in a hard-to-reach spot. Pretty neat stuff. It wasn't long before Fluke 77s were as abundant as Simpson 260s.

The New Generation

Not being a company to rest on its laurels, Fluke has recently come out with the next generation of DMMs, the 80 Series. The 80 Series truly represents the next generation of instruments, not just a new color case and a different ad agency. The features that made the Model 77 stand out were enhancements to the basic DMM operation—range hold, bar graph, diode testing. The features that make the Model 87 stand out are the inclusion of completely different test instruments along with the meter—a frequency counter and capacitor checker.

All the basic DMM features of the 77 are included and made easier to use. In addition, the Model 87 provides true RMS voltage readings. And the unit will report minimum, maximum, and average readings, on the various ranges, over a period of up to 36 hours.

It is tempting to place the 80 Series in the Fluke line right between the 70 Series and the 8000 Series of professional handhelds, but this series refuses to be pigeonholed. The Model 87 has a built-in frequency counter and it's not a second-thought feature. The counter has 200 Hz to 200 kHz ranges, with excellent accuracy and resolution. (While the accuracy over 200 kHz isn't specified, my test unit measured a 455 kHz local oscillator with no problem.)

We can't group the Model 87 with other audio frequency counters, though. It's also a capacitor checker. It measures from 5.0 nF to 5.0 µF, with 1% accuracy. (If we need to measure a cap greater than 5.0 µF, the folks at Fluke include a section in the manual that tells us how to estimate these values.)

If we decide to simply call the Fluke 87 a test instrument, taking the frequency counter and cap checker for granted, we still get a great DMM. Its display is back-lit for those dark nights. It calculates minimum, maximum, and average values. The user can define the amount of change that will allow a value to be recognized as a change—1 ms or 1 second.

Photo A. The Model 87 digital multimeter.

An "Input Alert" circuit tells you if you plug the leads into the wrong jacks for the function you have selected. A REL mode lets you take readings relative to a set value—or to zero out test lead effects when making sensitive measurements. Diode test. Continuity tone. The list of standard features goes on. In addition, various power-up features let you define parameters for specific measuring jobs—high input impedance on the low voltage range, MIN-MAX recording speed, 4½ digit display, disable beeper or auto-power off.

The Only Drawback

The Fluke Model 87 is truly a splendid instrument, and is destined to become the next "one on every bench" multimeter. It does have one small drawback, however.

The unit does so many different things that it may be difficult to remember some of the operations unless they are used often. Keep the manual handy.

If Fluke can produce a meter like this only a few short years after developing the Model 77, what will they have if I wait a year or two? Maybe a built-in o'scope, logic analyzer, signal generator, with a soldering iron that pops out the back. . . Hmmm. . . 73

Larry Antonuk WB9RRT has written numerous reviews on test equipment and electronics books. He currently works as a project manager for a land mobile service shop in Keene, New Hampshire. He enjoys home-brew projects, experimentation, and instrumentation. Contact him at P.O. Box 452, Marlborough NH 03455.

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CIRCLE 73 ON READER SERVICE CARD

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Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

VFO Design

Last month we talked about the ins and outs of VFO construction. This month we'll look at building a small VFO and some more details on good VFO construction. In QRP operation, the most common practice is to run the VFO at the same frequency as the transmitter. For this reason, we must have a stable VFO. Of course, you need a stable VFO at any frequency.

If you use some of the tips in last month's column, you should be on your way to a good rock-solid VFO. But if you don't have a well-filtered, regulated supply voltage, your efforts may be in vain. In most VFO circuits a simple zener diode regulator has become standard design. If you plan to use a VFO for a simple direct conversion transceiver, throw out the zener diode and replace it with a three-terminal regulator. Why? Some zener diodes are very noisy when they conduct (regulate). This noise can be picked up by the high-gain audio chain of the receiver and passed along to you, as white noise which can sometimes mask weak signals.

Because current requirements are low, you can use a 78L09 regulator. The 78L09 is in a TO-92 case, the same size as most of the newer plastic transistors.

While you're at it, regulate the VFO's buffer stages, too. The 78L09 can handle up to 200 milliamperes. This will keep the VFO from being pulled by the buffer stages, exactly the opposite of their intended duty.

The VFO I use in most of my projects comes from a old issue of *Ham Radio* magazine. December 1971, to be exact. The VFO was designed by Donald Nesbitt K4BGF. I've used this VFO for both direct conversion receivers and stand-alone transmitters. It is stable, easy to build, and quite compact. You can build a circuit board for this VFO; I don't know of a source for boards at this time.

Easy Circuit

The circuit is of a Seiler oscillator. See the figure for details. The circuit uses common parts. No one should have trouble getting this VFO to work.

Looking at the schematic, Q1 is the oscillator with Q2 and Q3 buffers/amplifiers. Notice the use of two separate capacitors for C3. This splits the RF currents, reducing internal heating of the components. C1 is the main tuning capacitor. Try to get a good quality unit. Of course, the old double-bearing jobs would be great, but let's face it: You just can't find them! A cheap capacitor will turn around and bite you.

Construction should begin with a circuit board or perfboard. If you use a PC board, be sure you don't use double-sided board. As I mentioned above, you can remove the zener diode and use a three-terminal regulator. This is what I've done in the past, and I've had no problem with stability. Mount the regulator away from the VFO. You sure don't want the heat from the regulator to influence the VFO's circuitry.

Although 2N2819s are called for in the VFO, I've used MPF102s and find they work quite well. You must remember to switch the leads on the MPF102 if you decide to use a PC board, since the lead-outs are different from the 2N3819s. Someone may also point out that the MPF102 is a bit noisy for a FET. I haven't had a problem using them with this circuit.

Toroid coils are used for L1. Be sure to use the core as specified. Others may not give you the desired results. Of course, you don't have to use a toroid core. I've used slug-tuned inductors and even mini-coils. If you use a slug-tuned inductor, be sure to mount the inductor very carefully. You don't want it moving about and causing instability in the VFO.

The various RF chokes with values as low as a few microhenries have been tried at RFC1 with success. Don't be afraid to try your hand at substitutions.

I placed the toroid core in boiling water for ten minutes to anneal the wire, which improves stability. For those of us who diet, there are only 35 calories in a boiled toroid. They're also fat and cholesterol free!

Testing the VFO

After you have assembled the VFO, test it by first applying voltage to the circuit and confirming 10 volts at the collector of Q3. Using a frequency counter, couple the output of the VFO to the counter. You can also use a general coverage receiver to find the output of the VFO. Take it from me, the counter is much faster. Place C2 about mid-range. Read the frequency of the VFO. If you used a toroid for L1, spread or compress the turns until the desired frequency is obtained. C2 sets the band edges of the VFO. If you can't get the VFO to tune the desired frequency, you may have to add or remove turns from the core. The more turns, the lower the frequency. If the frequency is too high, you can add more capacitance to the tuned circuits by paralleling a small value capacitor across C3. This will lower the frequency. Remember to use only high-quality capacitors in this circuit, such as NPO ceramic, polystyrene, and even silver mica capacitors.

If the VFO does not work, move back toward the oscillator and Q1. A good place to pick up a signal is from the gate of Q2. Avoid loading down the oscillator.

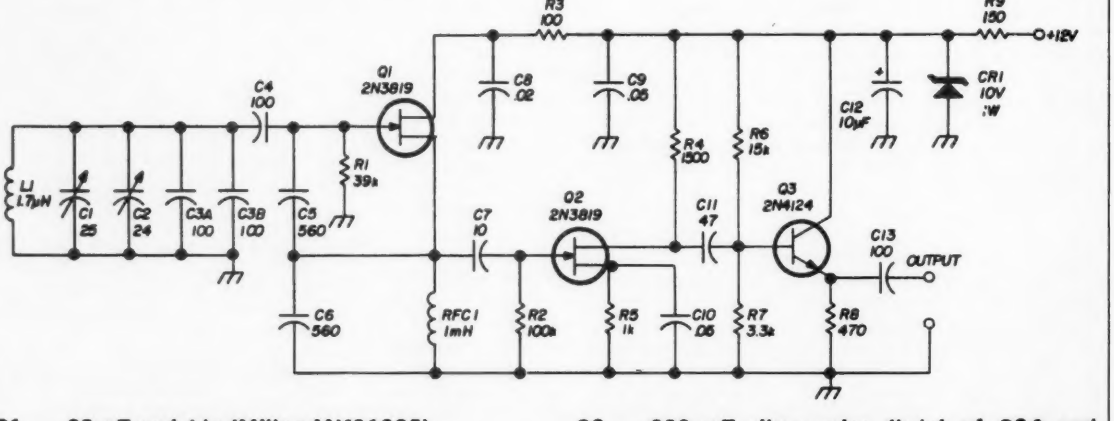
The VFO works, and works quite well. I know you'll find a good home for it in one of your projects. After you're happy with the results, apply some Q-dope to the coils. If you can't get your hands on Q-dope, RTV sealer works quite well. It is messy to work with, smells, and is hard to remove, but it works really great for VFOs.

Don't forget to place the VFO in a shielded box. This is most inportant for stable operation.

If you would like a reprint of the original article, drop me a buck for postage and copying costs, and I'll send you one. I don't have the space this month to reprint the artwork.

One more thing before I go. Don't forget to give those antennas a good fix before the frost gets too thick on the pumpkins. Clean the connectors and install new coax if needed. Remember, coax does not last a lifetime. This is especially true if you've been using cheap coax to begin with. When running QRP, using cheap coax will always come back to bite you, too! Use a coax sealer to keep water out of the connector. When replacing SO-239 connectors, don't use cheap imported jobs, they're too lossy.

As always, this is your column. Questions, comments and your favorite circuits and/or photos are most welcome. If the bands are dead, and you have a modem and computer, check out the QRP SIG on the 73 BBS at (603) 525-4438, (300-2400 bps) 8 data bits, no parity, one stop bit. You can also reach me via CompuServe at ID# 73357,222. Until next month, when you turn it on, turn it down. 73



C1 25-pF variable (Millen MK21025)
C2 2.4-24.5 pF (Johnson 189-509-5)
C3 200 pF silver mica (total of C3A and C3B)
L1 1.7 µH. 18 turns no. 20 enameled evenly spaced on Amidon T-68-2 toroid core

Seiler oscillator circuit. Component values shown tune from 7.0 to 7.3 MHz. (From Ham Radio, *December 1971.)*

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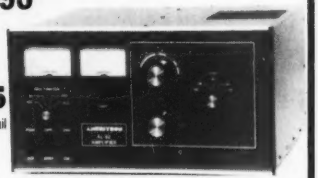

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The Coil Tester

Measure inductance and resonant frequency.

by Michael A. Covington N4TMI

How do you test a coil? Usually, you want to know two things: the inductance and the frequency at which it will resonate with a particular capacitor. This handy tester helps you find both. Connect it to any LC tuned circuit, and it oscillates at the resonant frequency, from below 20 kHz to above 20 MHz. What's more, at the flip of a switch, you can use the built-in 150 pF capacitor to make a tuned circuit out of any coil and deduce the inductance from the frequency at which it resonates.

You can read the frequency on a frequency counter, calibrated oscilloscope, grid dip meter, or communications receiver. From the frequency, you can find the inductance with the accompanying nomograph or computer program. The tester works with coils over a million-to-one inductance range—from 0.2 µH to 0.2 H or more.

The Search for the Circuit

For years I had been looking for an oscillator controlled by a single parallel tuned circuit. The Hartley and Colpitts circuits won't do because they require, respectively, a tapped coil and a "tapped" (double) capacitor. The Clapp circuit uses a single coil and capacitor, but they're in series. That's not good enough. I wanted an oscillator that would take a *parallel* tuned circuit so I could measure the resonant frequencies of IF transformers and other ready-made tuned circuits. Also, every coil has a self-resonant frequency at which it is parallel-resonant with its own internal capacitance; only a parallel-tuned oscillator will test this directly.

The circuit in Figure 1 does the job. It's adapted from a cathode-coupled oscillator described by F.C. Alexander, Jr. in the September 1946 issue of *QST*, pages 69–70, who credits it to F. Butler. Mr. Alexander reported that the oscillator would really take abuse; he found it would still oscillate at 10 MHz with a 6J6 tube with four volts on the filament and a mere *3 volts* (instead of the usual 300) for the plate supply. The FET version was first described by L.F. Heller in *Wireless World*, September 1969, page 409, but he used an RF choke instead of my resistor R1.

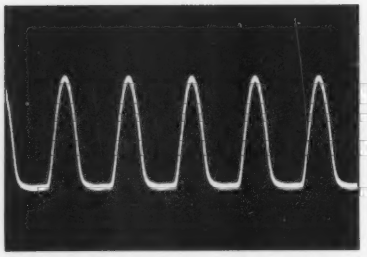

Photo A. The output waveform consists of half-sine-waves and is rich in harmonics.

Photo B. The oscillator is housed in an instrument case. Labeling is done with dry transfer lettering on Contact™ self-adhesive plastic. A frequency counter provides the most convenient readout, but you can also use an oscilloscope, dip meter, or communications receiver.

Understanding the Circuit

Think of Q1 as a source follower and Q2 as a common-gate amplifier. The two stages communicate by sharing source resistor R2. Positive feedback goes through C2, and the tuned circuit ensures that the feedback is only effective at the resonant frequency.

The high supply voltage (18 volts) helps extend the frequency range and improves the performance with low-Q tuned circuits. The oscillator won't work with a crystal, but it will sometimes oscillate with a resistor in place of the coil.

The output, rich in harmonics, is taken across R2 (Photo A). R3 provides some output isolation; without it, a capacitive load—such as the internal capacitance of a long cable—could sometimes stop the oscillation.

Construction

I built the oscillator on perfboard and housed it in a Radio Shack instrument case (Photos B and C). The layout is not critical as long as all leads are kept short. Even the test leads should be short—just long enough to reach out of the enclosure—because their inductance is part of the tuned circuit.

Switch S1 is also part of the tuned circuit;

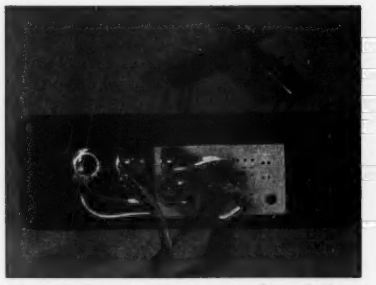

Photo C. Circuit is built on perfboard. Keep all leads short.

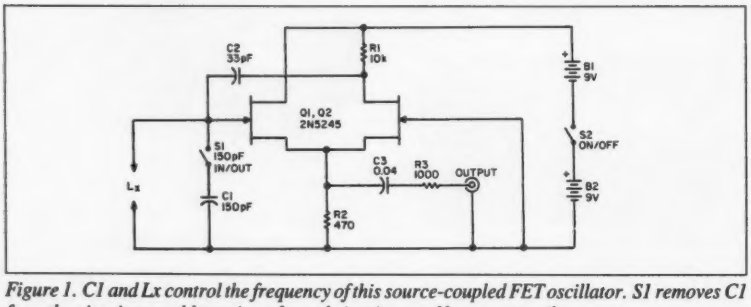

Figure 1. C1 and Lx control the frequency of this source-coupled FET oscillator. S1 removes C1 from the circuit to enable testing of tuned circuits or self-resonant coils.

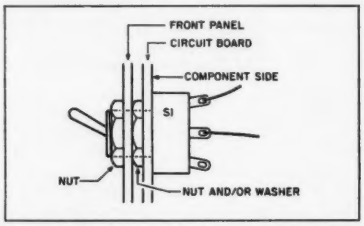

Figure 2. To keep leads short, S1 mounts in a hole in the circuit board.

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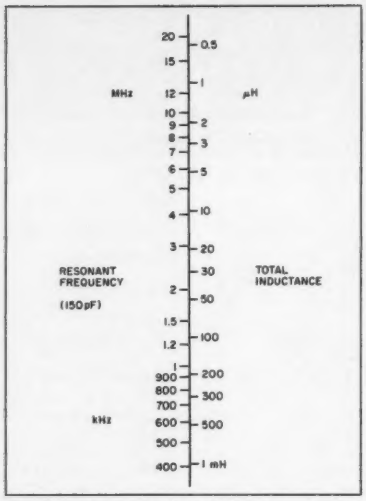

Figure 3. Nomograph to find inductance of a small coil from a single frequency reading. Inductances up to 0.1 H can be measured by taking two readings (with and without the 150 pF capacitor) and doing calculation.

```
100 CLS
110 PRINT "COILTEST.BAS -- M. Covington 1989"
120 ' For measuring inductance with test oscillator
130 PRINT
140 ' --- Constants ---
150 PI = 3.14159
160 LS = 0          ' Stray inductance, in H, if known
170 CS = 0          ' Stray capacitance, in F, if known
180 CT = 150E-12    ' Switchable capacitor = 150 pF
190 ' --- Get input from user ---
200 PRINT "Frequency with capacitor (MHz) ";
210 INPUT F2
220 F2 = F2 * 1E6   ' convert MHz to Hz
230 PRINT "Frequency without capacitor (MHz, 0 if no osc.) ";
240 INPUT F1
250 F1 = F1 * 1E6   ' convert MHz to Hz
260 PRINT
270 ' --- Calculations ---
280 IF F1 = 0 THEN CD = 0 ELSE CD = CT / ((F1 / F2) ^ 2 - 1)
290 L = (1 / (2 * PI * F2 * SQR(CD + CT))) ^ 2 - LS
300 PRINT "Inductance (H):", L * 1E6
310 IF CD = 0 THEN 340
320 PRINT "Distrib. capacitance (pF):", (CD - CS) * 1E+12
330 ' --- Table of resonant frequencies ---
340 PRINT
350 PRINT "Resonant frequencies with this coil:"
360 PRINT "C (pF)", "F (MHz)"
370 FOR I = 1 TO 9
380 C = 1E-12 * 2^I
390 F = 1 / (2 * PI * SQR(L * C))
400 PRINT C*1E12, F*1E-6
410 NEXT I
```

Figure 4. This program finds inductance and distributed capacitance from frequency measurements. It was developed on an IBM PC but should run in practically any version of BASIC.

to save lead length, I mounted it through a hole in the circuit board, and the switch itself attaches the circuit board to the front panel (Figure 2). The batteries are held by clips mounted on the back panel (Photo D); the clips are lined with vinyl tape to keep the batteries from slipping out.

Measuring Resonant Frequency

The simplest way to read out the frequency of oscillation is to use a frequency counter (Photo B). Make sure the reading is stable and is the same with the counter set on more than one range. You can also measure frequency with a calibrated oscilloscope:

Frequency (MHz) = 1 / Length of one cycle (microseconds)

Don't strive for great accuracy; because of stray capacitances and inductances, your results are bound to be off by a few percent.

You can also determine the frequency by tuning in the oscillator on a communications receiver. No physical connection is needed; just place the receiver close to the coil and look for an unmodulated carrier. When you find it, also try one-half, one-third, and one-fifth of that frequency to determine whether you initially heard a harmonic.

Or you can use the ham's traditional tool, a grid dip meter. To do this, start up the test oscillator, then use the dip meter as a field strength indicator. That is, set its gain so that it does not oscillate, and place its coil right next to the coil under test. Tune across the band until you get a slight but sharp peak in the meter reading. This is more accurate and more sensitive than testing a tuned circuit with the dip meter by itself.

What's the Inductance?

To find the inductance of a small RF coil, measure the frequency of oscillation with C1 in the circuit. You can then find the inductance with the nomograph in Figure 3. In fact, you may want to stick a copy of the nomograph to the top of the test oscillator.

The nomograph works as long as you're dealing with a coil whose internally distributed capacitance is small. Any coil with more than 50 turns is likely to have appreciable distributed capacitance. Fortunately, you have an easy way of measuring this, too—just read the resonant frequency with C1 out of the circuit as well as in it. Then use the BASIC computer program in Figure 4 to do the calculations, or work through the formulas from the program on your calculator.

The program was written on an IBM PC but should run in practically any version of BASIC. It finds the inductance and distributed capacitance, then prints a table of resonant frequencies and the capacitances needed to obtain them (Figure 5). That's helpful because usually, hams don't really want to know inductance for its own sake; they want to make a resonant circuit for a particular frequency.

```
COILTEST.BAS -- M. Covington 1989

Frequency with capacitor (MHz) ? 0.58
Frequency without capacitor (MHz, 0 if no osc.) ? 1.77

Inductance (μH)                  448.0866
Distrib. capacitance (pF)        18.04398

Resonant frequencies with this coil:
C (pF)          F (MHz)
 2              5.316484
 4              3.759322
 8              2.658242
 16             1.879661
 32             1.329121
 64             .9398304
 128            .6645605
 256            .4699152
 512            .3322802
```

Figure 5. Sample output from the computer program. These data are from a coil labeled 470 μH, 5%.

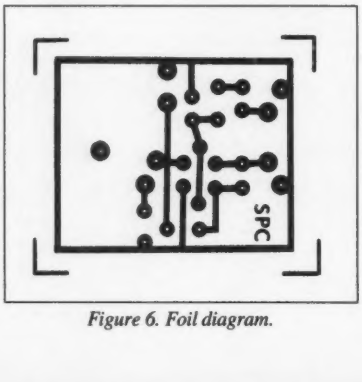

Figure 6. Foil diagram.

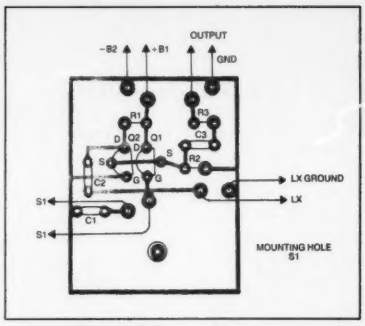

Figure 7. Parts placement.

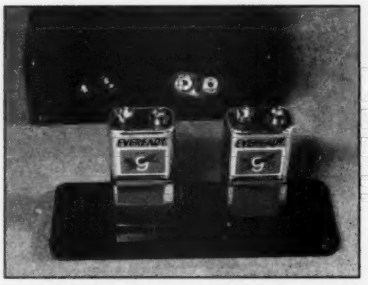

Photo D. Batteries are held by clips on the back panel. Line clips with vinyl tape to keep batteries from slipping out.

If you test an IF transformer, you'll get an inductance and a distributed capacitance that includes the built-in capacitor. For instance, a 10.7 MHz IF transformer that I tested came out as 3.6 μH in parallel with 60 pF, and according to the table displayed by the program, it will tune 40 meters if I add slightly more than 128 pF.

Improving Accuracy

You'll notice that the program has variables for the stray inductance (LS) and stray capacitance (LC) of your setup, in henries and farads respectively. In the program as shown, they are set to zero, but you can gain additional accuracy by measuring or estimating them and putting them into the program.

Stray capacitance is hard to measure and is fairly unimportant, since the 150 pF capacitor completely swamps it. As a ballpark estimate, try 1 pF, which you would enter into the program as CS = 1E−12 (i.e., 1 x 10^{-12} farads).

Stray inductance is more important. It's likely to be about 0.2 μH. To measure it, wind three or four turns of solid hookup wire into a small coil, then measure the resonant frequency with C1 in the circuit. You'll probably get something like 20 MHz. Now spread out or unwind the coil to make the frequency rise. You'll get a maximum frequency around 25 MHz before oscillation stops. Put this frequency into the computer program, and you'll get back a fair approximation to the stray inductance of your setup. Now modify the computer program to make this number the value of LS (for example, if it's 0.2 μH, make LS = 0.2E−6).

By the way, this is not the highest frequency at which you'll ever see oscillation. A high Q tuned circuit can override the low Q stray inductance and make the oscillator run as high as 120 MHz.

An Essential Tool

Two weeks ago I didn't know an oscillator like this could be built. Now I don't know how I'd get along without it. The ability to measure inductance and resonant frequency is so fundamental to RF circuit design that an instrument like this belongs in every ham shack. 73

Michael Covington N4TMI does research in computational linguistics. In his spare time he works 40 and 15 meter QRP CW, builds gadgets, programs IBM PCs, looks at the stars, and writes. He is the author of Astrophotography for the Amateur, *and co-author of* Prolog Programming in Depth *and* Dictionary of Computer Terms. *You may reach him at Artificial Intelligence Programs, University of Georgia, Athens GA 30602.*

Parts list

B1, B2	9-volt radio battery	RS #23-464
C1	150 pF, 50V	5% polystyrene preferred
C2	33 pF, 20%, 50V	ceramic disc
(When using Radio Shack parts, buy two each 100 pF and 47 pF. For 150 pF use 100 and 47 pF in parallel. For 33 pF use 100 and 47 pF in series.)		
C3	0.04, 0.047, or 0.05 µF, −20%/+80%, 50V	RS #272-134
Q1, Q2	2N5245 or 2N3819 FET	RS #276-2035
R1	10 kΩ, at least ¼-W	RS #271-1335
R2	470Ω, at least ¼-W	RS #271-1317
R3	1k, at least ¼-W	RS #271-1321
S1, S2	subminiature SPST or SPDT switch	RS #275-624
2 battery connectors		RS #270-325
2 clips to hold batteries		RS #270-326
RCA-type phono jack		RS #274-346
Test clips		RS #270-336
Perfboard, wire, misc. hardware and labeling		

Note: A blank PC Board is available for $4 ppd. and a kit of all parts except the enclosure and batteries is available for $15 ppd. from Chris Hethorn KM8X at Small Parts Center, 6818 Meese Dr., Lansing, MI 48911. Phone (517) 882-6447.

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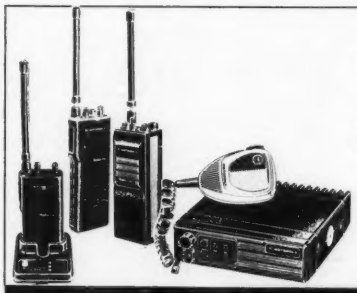

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73 Review

by Bill Clarke WA4BLC

Ameritron AL-82 Linear Amplifier

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Price Class: $2000

The amateur radio market of today offers many high-power HF linear amplifiers. Some are capable of full power (1500 watts out) and others offer about half that. Some of these amplifiers offer features such as automatic tuning, exotic (read: expensive) tubes, and/or complex operation monitoring and protection circuits.

When dealing with linear amplifiers I am impressed with simplicity, ruggedness, and ease of operation. Amplifiers that use microprocessing and exotic tubes hold little interest for me, as I am always in fear of possible later problems from the complexities involved and the expense of service.

Ameritron's AL-82 has given me what I want. The RF deck consists of two Eimac 3-500Z tubes and the associated components to get the power safely out on the proper frequency. Nothing more!

The Boxes Arrive

There were three boxes in all. Ameritron ships the amplifier in a box without the HV plate transformer or tubes installed (to prevent possible damage from rough handling during shipment). The latter items are shipped separately in other boxes. Everything is very well packed and not likely to be damaged in transit.

I removed the amplifier from its box, then got the tubes and transformer out of their boxes. Out of curiosity, I weighed the transformer. A full 32 pounds of Peter W. Dahl Hypersil quality! Weight is how quality is measured in transformers and power supplies, isn't it?

Inside the Case

Carefully following the AL-82's instruction manual, I installed the transformer, tubes and chimneys. All went well except for an incorrect connector on one of the transformer's primary leads. I replaced this, then continued making the necessary connections. I would have appreciated an extra half inch of secondary leads—what was there was barely adequate.

While the case was open I closely examined each component and the power supply circuit boards. The boards are Fiberglas™ with very accurate and smooth circuit traces. This is an important point, as HV power supply PCBs are a weak point on some amplifiers I have used and serviced in the past. Sloppy circuit boards cause shorts and/or arc-over points, which in turn cause the amplifier to fail, triggering acute operator anxiety and frustration, particularly when sparks fly and smoke comes out of the unit.

Photo A. Front panel of the AL-82, showing the dual meters and controls.

I was impressed by the quality of the components and the mechanical installation of the various parts. Nothing was loose and all the solder work looked good. The cooling fan is in a cast metal case and the tubes have chimneys over them. No overheating should occur.

Interestingly, a check with the Ameritron factory in Toledo, Ohio, revealed that the power supply and RF deck of the AL-82 is the same as that of the AL-1200 (using the 3CX1200A7 tube) and AL-1500 (using the 3CX1500/8877 tube) amplifiers.

General Features

The AL-82 has two large meters: one for grid current; the other a multimeter for plate voltage, plate current, peak RF output watts and ALC. The grid current meter gives the quickest indication that all is OK when monitoring amplifier operation. Having this meter constantly available for monitoring is an excellent idea.

The plate tune and plate load controls both have very smooth-operating 6:1 reduction drives.

The Eimac 3-500Z tubes are fast to start up, requiring only a few seconds for warm-up (no timer or delay circuits). They are also comparatively inexpensive when it comes time for replacement (which should be a long time away).

Two bias settings are provided to allow optimum performance on CW and SSB.

An operate/standby switch allows barefoot operation without turning the amplifier off.

A red LED indicates on-the-air (key-down).

12 VDC at 100 mA is available on the rear panel.

As an optional feature Ameritron provides a very fast pin diode RF switch for its full line of large amplifiers. Called the PIN-5 QSK Switch, it is perfect for AMTOR and QSK. You can have the factory install it before shipping the amplifier, or you can buy and install it later.

Operation

First and foremost, you must have adequate AC power to operate this or any other full power amplifier. I use #10 copper wire from the breaker box to a single outlet, and the amplifier is the only appliance using the circuit. This provides adequate amperage and prevents voltage drops.

I placed the amplifier in a position to provide adequate cooling and hooked it up to my station ground. I used my trusty ICOM 751-A as a driver during the tests, providing more than enough excitation. I also placed a monitor scope in line to ensure that I was not over-driving the amplifier or flat-topping, and to view the CW waveform.

Using all new RG-213 for interconnections, I brought the AL-82 on line and tuned it up on 75 meters. Everything went well and there wasn't any smoke. I was amazed at the quiet operation of the amplifier and experienced no objectionable fan noise—the computer I am using to produce this text is far noisier than the amp. No doubt this is due to that fine imported German fan.

I followed the tune-up directions and everything went smoothly. All meter readings came up as described in the manual. Using a Bird wattmeter, I watched the power output and compared it to that of the AL-82's power meter. There were some slight variations, but in general the panel meter was quite accurate. Remember, the meter is peak reading, so you will see a good indication of your output power.

I connected to the ALC line and made the necessary adjustment to maintain full legal power output. The amplifier is capable of slightly more than 1500 watts. But, as you will learn in the discussion of the law of decibels later in this article, you will really gain nothing from running over the legal limit, and you could damage the amplifier!

While using the AL-82 I monitored the meters and noted no discrepancies. The HV me-

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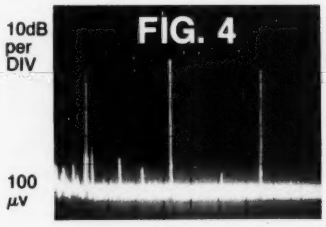
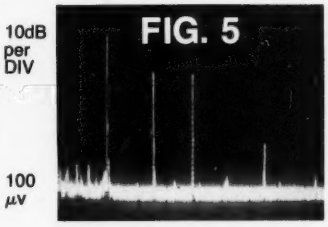
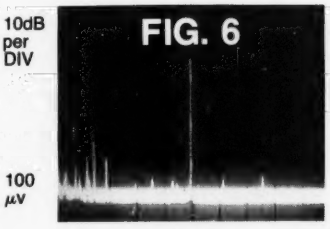
Signals picked up by the low capacity input of the Spectrum Probe allow rapid evaluation of problems. Simply placing the probe near a component allows judgment of whether it is active. RF failures are easily established.



A cordless phone (base station) is probed near its 38.970 crystal in fig. 4. Both 39 MHz and its second harmonic are obvious. The lowest line at 10.245 is also obvious and can be established by probing the adjacent 10.2 crystal, which then shows 10MHz as higher level than 38MHz. We have established receiver RF oscillator/system operation in seconds with no connection, information, schematic, etc.!





When the transmitter is activated (by pressing CALL), probing near the 15.537 crystal provides fig. 5. Fundamental operation and many harmonics are shown. As the probe is placed near the following stages, the fundamental is decreased, and the third accentuated until the relatively clean output of fig. 6 is obtained near the antenna lead. The transmitter RF is visible in seconds!

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Photo B. Note the Peter Dahl Hypersil transformer, the heart of this beefy amplifier.

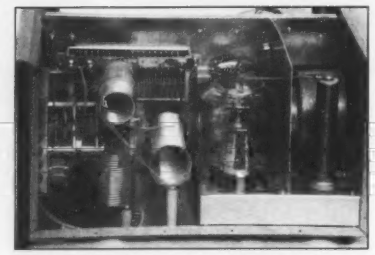

Photo C. The RF deck has silver plated components. To the right of the tubes you can see the cast metal case fan that forces air through the tube chimneys.

ter showed 3700 volts during idle and 3500 volts during key-down. That indicates a hefty and well-regulated power supply.

Contacts were made on 160 through 15 meters, providing me with an opportunity to see what the amplifier could do on each band. Typical changes in S-meter readings at receiving stations varied from 10 to 20 dB increase in signal strength over my barefoot signal. On several occasions I was told I was not heard when I switched the AL-82 to standby and went barefoot.

No complaints were heard about flat-topping, but I did get a few comments from stations operating on adjacent frequencies. They were sometimes less than courteous in referring to QRM. This is why you should only use the minimum power necessary to maintain contact, keep the input signal as clean as possible, and have regard for your fellow hams.

There were no reports of objectionable fan noise. This point is important, as many amplifiers are noisy in operation to the point of fan sounds getting into the mike.

CW operation went as expected, although I wasn't able to test the optional PIN-5 QSK switch (not installed on this unit). The scope patterns were a mirror of the exciter running barefoot and the power output was typically 1400 watts. For the CW operator using full break-in, I think the QSK option would really be nice.

When using an amplifier such as the AL-82 you must recognize the potential of its full power—the 1500 watts output. This is a significant point, as some amplifiers using the same tube complement are unable to provide this level of output due to weak power supplies.

Opening the unit for periodic maintenance (cleaning out accumulated dust) will be quick, easy, and safe—"safe" providing you read and heed the instructions about high voltage shock potential. Remember, at the voltages found in the AL-82 (and all similar amplifiers) one wrong move and you will be remembered on the bands as: "Too bad about old what's-his-name. Got fried, ya know."

Consideration

Part 97 of the rules requires us to make our contacts using the least power that will provide reliable communications. You don't need to run a full 1500 watts out to talk into the next county. Be considerate of other hams.

Good Points

I like being able to turn the amplifier on and have instant power. The exotic tubes used in some amplifiers require as much as three minutes warm-up time.

The vernier tuning controls are very smooth turning and let you make precise settings.

3-500Z tubes are very economical (when the need arises).

The cooling fan is very quiet.

The separate grid meter is great.

Inrush filament current limiting is provided to protect the tubes at turn-on.

The Ameritron warranty covers the amplifier for one year (except the tubes, which are warranted by Eimac).

Recommendations

I think the band selector switch should be labeled with all the WARC bands (only 17 meters is included as in 15/17) and 10 meters should be labeled as such, not as AUX. Most hams will make the modification anyway.

It is unfortunate that licensed amateurs must make modifications to an amplifier to allow use on 10 meters. Such is the state of affairs in this country—punish the masses for the infractions of the few.

The little red LED that indicates key-down is insignificant. It should have been larger.

Is It For You?

Would I recommend the AL-82? An emphatic "yes" to those requiring a rugged and trouble-free full power amplifier. This amplifier is constructed like the typical battleship and should provide thousands of carefree hours of operation. However, I want to point out that all amplifiers of this type do have drawbacks and are not for everyone.

They are very large, heavy and expensive. Consider this before purchasing one. Also, remember that you may have to do some electrical work in order to provide the necessary 240 VAC a full-power amplifier requires for operation. You must use heavy coax, such as RG-8 or RG-213, when operating at high power. No more RG-8X or RG-58.

The Law of Decibels

In understanding what a linear amplifier can do for you, consider the following: It is generally recognized that there is a 3 dB increase in received signal strength for every doubling of transmitted power. This equates to the signal of a 100 watt exciter being raised approximately 12 dB when amplified to the 1500 watt level.

Once again, it's not necessary to run this amplifier at full power for reliable communications. The difference between 800 watts and 1500 watts is about 3 dB, a small difference at the receiving end. However, it's good to know that the AL-82 can give you that extra boost whenever you need it. 73

Manufacturer's Specifications

Input
- Circuit type: Pi-network, slug tuned coils
- Maximum VSWR at resonance: 1.2:1
- Minimum 2:1 VSWR bandwidth: 20%
- Maximum drive power permissible: 130 watts
- Typical drive for full power output: 100 watts

Output
- Circuit type: Pi-L, Pi
- Half-hour continuous carrier: 1500 watts (below 18 MHz)
- 30-second continuous carrier: 1800 watts plus
- Half-hour PEP two-tone test: 1800 watts
- 30-second PEP two-tone test: 1800 watts plus

Power Supply
- Circuit type: full wave bridge, capacitor input
- No load voltage: 3600 V
- Full load voltage: 3300 V
- Full load current: 0.8 amp
- Regulation: 10% or better
- Transformer: Hypersil
- Capacitors: 26 µF total, computer grade
- Maximum draw at rated output: 13 amps at 240 VAC

Tubes
- 2 3-500Z
- Continuous dissipation : 1000 watts
- Warm-up time: 5 seconds

Metering
- Multimeter: HV, IP, RF Out, ALC
- Grid: grid current

ALC: negative going, 0-20 V (adjustable)

Efficiency (typical)
- CW: 65%
- SSB (envelope crest): 62%

Frequency Coverage
- All ham bands (WARC uses nearest standard band)
- 10 meters available upon request to licensed amateurs

Keying: 12 VDC circuit requires external relay switching to ground

RF Connectors: SO-239s

AC Line Connector: NEMA 6-15P 240V style

Dimensions: 18.5 x 17 x 10 inches (DWH)

Weight: 77 lbs. (with transformer installed)

Third Order IMD: −34 dB at 1500 W output

73 Review *by Phil Nowak KA9KAF*

The Weller® Cordless Pyropen™

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Price Class: Self-igniting model (WPA-2), $85; Non-self-igniting model (WSTA-3), $78; Pyropen Junior (WST-2), $62

When I first saw the Weller Cordless Pyropen, I became fascinated by this small soldering pencil. Its attractive design reminded me of an oversized drafting pen. It's the kind of item that has impulse appeal. I could almost hear it saying, "Buy me! Buy me!"

When the Pyropen arrived, I carefully read the instruction sheet supplied with it. The instructions were clear and straightforward.

One of the attractive qualities of this product is that it doesn't need a power cord. It runs on butane gas, just like a cigarette lighter. Unlike my cordless rechargeable soldering iron, this unit will run three to four hours on a gas charge. Recharge time is in seconds instead of hours. It is also electrically neutral; it will not introduce an electrical charge to the item you're soldering.

The unit arrived charged with nitrogen gas. For safety reasons, the manufacturer does not ship them filled with butane gas. You can buy butane gas at your local supermarket or drugstore. I bought some gas, charged the unit, opened the main gas valve, and pushed the ignition button. There was a rush of air, a whistling sound, a three-second countdown, then ignition. When the six small round windows in the housing that holds the soldering tip start to glow orange the Pyropen is on and hot. It heats up in a hurry.

Three Sleek Models

The Pyropen has nice balance in the hand when soldering, and looks like a precision tool. The factory told me this unit was designed in Germany. It has that look and solid feel of Teutonic engineering, like a Mercedes Benz. The factory told me they looked at hundreds of products before selecting this one.

I had noticed three different versions of the cordless Pyropen at Radio Expo. I got the self-igniting model (SI). The second model (NSI) is almost identical except that it is not self-igniting. You light it with matches. The third model is smaller, slightly larger than an old-fashioned fountain pen, and also requires matches to get it going. This smaller Pyropen is called the Pyropen Junior.

The SI model is designed for outdoor use. The ignition area is shielded and the Pyropen can be fired up without matches, even while the wind is blowing. The NSI model is designed for indoor use where wind is not a problem. Its market is primarily for the test bench. The Junior model is more of a traveling technician's tool. It, too, has a protective cap, but it is much smaller and fits in a shirt pocket.

There are functional differences as well. The Junior model has a thirty-minute gas capacity. While all the Pyropens use a catalyst to burn the butane gas with no open flame, the NSI model can be configured to produce an open flame. A device called a torch ejector replaces the soldering ejector (the device which holds the catalyst and burns the gas) and allows the NSI model to function as a brazing torch. This feature is not found on the Junior or SI models. There are lots of interchangeable tips for the SI and NSI models, including hot air nozzles for heat shrink tubing. I liked that feature. The brochure suggests other uses for the hot air such as drying glues and solvent.

Caution: Not only does the tip get hot while the Pyropen is on, all the up-front metal parts get hot as well. There is little mass involved so the unit does cool rapidly once it's turned off. Another caveat: The small ignition wire on the SI model is somewhat delicate. I suggest leaving it alone.

Another nice feature is the temperature adjustment. The brochure says it ranges from 200 to 500 degrees C. This lets you solder delicate components without cooking them. If you need something hotter, just turn up the heat.

It Works!

This review wouldn't be complete without putting the unit to work. I had a few projects sitting on the shelf just waiting to be dusted off. One of these involved some delicate soldering in small spaces. Does this sound familiar? The heat control let me get the job done without cooking everything. I didn't use all the wires on one of the cables I made up. I folded these back along the cable and covered them with heat-shrink tubing. I removed the soldering tip and replaced it with the hot air tip. Even on low heat, the Pyropen did its job. I shut the unit off during lulls in my soldering activity to conserve fuel. That's also a safety feature. Don't leave a hot soldering iron just lying around on the workbench!

Whether you have a soldering iron or not, the Cordless Pyropen makes a handy addition to any workbench or toolbox. You can buy Pyropens in hardware stores, at larger hamfests or directly from The Cooper Group. 73

Contact Phil Nowak KA9KAF % Cogito Corporation, 3835 West 56th Place, Chicago IL 60629.

Photo A. The Weller Pyropen Jr.

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Working Without A Net

If you've been following my column, you know that I always insist that you get the schematic for anything you need to fix. Working without one is like painting blindfolded. It can be done, but it ain't easy. Unfortunately, there are times when you have no choice.

You've just picked up that unusual rig or piece of test gear with the "unique" name on it from your local hamfest ("Of course it works," they said), only to find it dead on arrival or, at best, gasping its last breath. Naturally, the manufacturer is either out of business or no longer stocks anything, including the manual, for your obsolete find. And if you think this kind of thing only happens with old tube boat anchors, think again. Solid state has been around long enough now that there are plenty of transistorized boat anchors out there, too. (Of course, they anchor your boat just as well, even though they're smaller and run cooler!)

Grab Your Brushes...

So, let's embark upon a discussion regarding repairs without diagrams. Got those blindfolds on? Grab your brushes!

As I've mentioned many times, all electronic devices are designed and built in stages. They all have some kind of power supply, input, signal process and output. When you approach one with no road map, the first, second and third considerations are: SAFETY, SAFETY, AND SAFETY. Look at your machine, rig, or whatever, and ask yourself: Can I get hurt on this thing?

If it's a solid state receiver, probably not. Just stay away from anything connected to the AC line, and you should be fine. The rest of the circuitry is likely to be at low voltage (but see note below). If it's a transmitter, though, you could get quite a jolt from the output stages, should you actually get it to transmit. Under the right circumstances, 100 watts or even 10 watts of RF is enough to injure or kill you. And remember: Anything with tubes is guaranteed to have dangerous voltages. (Note: This can include the fluorescent and neon readout tubes used for frequency displays in receivers. If the readout is orange or blue-green, it is tube-type, and probably driven by semi-dangerous voltages, perhaps in the 40 to 200 range. If it's red or green, it's probably LED, and safe.)

The most dangerous tube circuits are those involving CRTs. Computer monitors, TVs and oscilloscopes fall into this category. The voltages on CRT anodes are *extremely* high, ranging from maybe 2,500 volts for a small oscilloscope to more than 30,000 volts for a color TV. And there's enough current to kill you in short order. So don't mess with this stuff unless you really know what you're doing.

The most dangerous solid state circuits are switching power supplies. Many of their components are tied to the AC line, and can do you in. Although they are not common in radio gear, they are used in nearly all desktop computers and many monitors. If you absolutely *must* try to fix one, do all your testing with the AC line disconnected and the capacitors discharged. *Never* poke around in one of these while it's plugged in—it could be your last poke.

Getting Started

The sequence of the repair job is the same as it is when you have the diagram. The big difference is in recognizing the various circuit stages on sight, and coming up with some good guesses regarding the input and output connections for each stage.

Let's assume that the device to be repaired is a solid state radio with a linear power supply. As always, check first to see if the unit lights up at all. If not, go right to the power supply and check the fuse, if there is one. Naturally, change it if it's blown. If it blows again, you've got a short somewhere.

Follow the transformer output leads to the rectifiers. These will feed the filter caps (which will be large electrolytic types). Next, you should come to a regulator transistor or IC. Most likely, it will be mounted on a decent-sized heat sink. If it is getting very hot, too much current is being drawn through it. Also, it may be damaged.

Follow its output to the end of the supply, and you should wind up at a wire or PC board trace which feeds the rest of the rig. Disconnect it and turn the rig on. If the voltage at the supply's output is now OK, the short is somewhere else in the rig. If it's still dead, or still blows the fuse, something's gone in the supply. It may still have been blown, however, by a short in the rig. In fact, that's likely.

If the rig lights up but behaves wrong, try to eliminate as many stages as you can, right from the start. Obviously, if there's audio of any kind, even just hiss, the speaker and audio amp are OK. If the frequency readout is scrambled but the rig still works, don't waste your time in the IF stages!

OK, so you know all that. But how do you tell the IF from the front end from the transmit amp? The kinds of parts used are often a dead giveaway. Here's a brief rundown of what you're likely to find:

Power supply regulator: Big transistor or IC mounted on a heat sink or screwed to the chassis. Usually round. Look for big filter caps.

VFO: If it's analog, it'll probably be in a big shield. Look underneath the shield for an air-gap tuning capacitor. It should be right behind the main tuning knob. If it's digital (a frequency synthesizer), follow the output of whatever's connected to the tuning knob. It'll probably lead you to a bunch of ICs. Synthesizers are extremely hard to fix without schematics (and not so easy with them, either). Fortunately, the technology is new enough that you can nearly always get the diagram for a synthesized rig. That may not be the case ten years from now.

Local oscillators: Look for crystals and variable inductors. It may be hard to tell these from IF stages. If there are several in a row, that's probably the IF, not the local oscillator. Also, crystals are always in small, flat, metal cans, while their cousins, the IF filters, are usually plastic, or very large.

Receiver front ends: Follow the antenna. If there's a TX/RX relay, it can be hard to follow, but try to trace through the contacts in their resting position. Virtually all relay rigs pull the relay in for TX, and release it for RX. (While you're there, give the relay a good cleaning. In seconds, cleaning can solve many problems in older relay rigs.)

When there's no relay, you will probably find a series of diodes and capacitors splitting the antenna and sending it to both the receiver front end and the transmitter finals. You'll have to follow it both ways to see which is which. Whichever path leads to smaller components is the receiver! Front end parts are small, with tiny coils, and sometimes dual-gate (four-legged) transistors.

Mixers and IFs: Mixers can be hard to find on sight, but should be easy to locate if you have found the front end. Just follow its output, and you're there. Mixers have two inputs, one from the front end and one from the local oscillator or frequency synthesizer. The output leads right to the IFs. These are easy to spot—just look for several can-type adjustable coils in a row.

AGC amps: These are really feedback loops. They are usually made from transistors, and take their inputs from somewhere near the last IF stage. The output goes back to the front end or first IF stage, controlling the receiver's overall gain. A bad AGC amp can make the entire receiver seem weak or broken.

Detectors: In AM rigs, these can be no more than a diode. For FM, an IC or several diodes connected to an IF-type can are common. For SSB, anything from four glass diodes in a bridge rectifier-type arrangement to an IC may be found. In any event, the detector is always at the output of the IF strip, so it should be easy to find. If all else fails, trace the wire coming from the high side (not the center) of the volume control. In multimode rigs, of course, there may be several detectors, with the appropriate one typically selected via some diodes coming from the mode selector switch, or from the digital system, if there is one.

Low-level audio amps: Follow the center lead of the volume control. It should lead directly to the first stage of the audio amp. The amp may be an IC, but it is more likely to be made from discrete transistors.

Squelch circuits: These are usually near the first audio stage, and can be hard to separate from it. Just follow the wires from the squelch control. Most squelch circuits consist of one or two transistors and a few diodes. A dead one can mute the audio amp, making the rig appear more broken than it actually is.

Audio power amps: There is often no clear dividing line between the low-level amp and the power amp, because the audio amp chain typically has a number of stages to build the signal up gradually. Of course, the final stage which drives the speaker can be considered the power amp, and it is usually a push-pull arrangement of some kind. In some rigs, it is a power IC, and may be mounted to the chassis for heat sinking.

Mike amps: Follow the mike lead. There may be several stages, with some AGC-like circuits for compression or level control. Basically, they are much the same as any other low-level audio amps.

Modulators: This is tricky because it depends on the mode (FM, SSB, etc.), and may have many variations even within a given mode. Generally, when the output of the mike amp stops looking like audio circuitry, you've found the modulator! It may be four diodes in a mixer-like arrangement, an IC or even a coil/capacitor (L/C) setup. Like a mixer, it will have two inputs and one output. One input, of course, will be from the mike amp, and the other will be the carrier to be modulated. The output should feed some transmit amps or other mixers.

Well, I seem to be running out of space, so what do you say we continue this next month? Meanwhile, good luck and be careful! A hint: It always takes *much* longer to work without a schematic than it does with one. I guess that's just part of the price you pay for getting a bargain. 73

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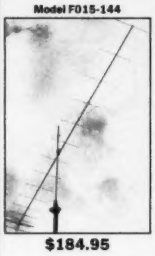

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ELECTRICAL SPECIFICATIONS:
Measured gain ..... 13.7 dBd
E-Plane beamwidth ..... 31 deg
H-Plane beamwidth ..... 33 deg
Sidelobe attenuation
1st E-Plane ..... −17.5 dB
1st H-Plane ..... −15 dB
SWR ..... 1.13:1 typical
F/B ratio ..... 21 dB
impedance ..... 50 ohm
MECHANICAL SPECIFICATIONS:
Length ..... 24 ft. 8 in.
Boom .. 1.5" 6061 T-6 Aluminum
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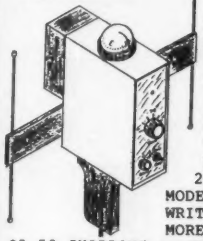

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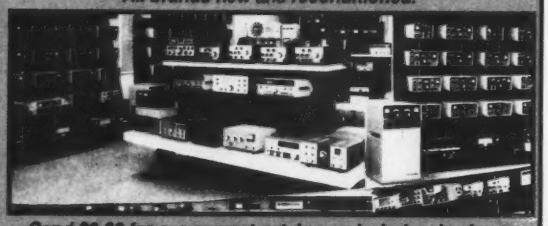

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New DXCC Countries?

The DX Advisory Committee (DXAC) has received two more applications for separate country status. The DXAC will consider these applications, then recommend whether they are worthy of being added to the DXCC Countries List. The ARRL Award Committee makes the final decision.

Penguin Islands, South Africa

This application was submitted by Bill KC1AG (who submitted the successful Walvis Bay application), Hans DK9KX and Ian ZS9A.

According to the application, the Penguin Islands are a group of 13 tiny South African guano islands, located along the coast of Namibia, north and south of Luderitz. The islands are located off the restricted diamond area of Namibia. The preferred names for these islands are: Albatross Rocks, Halifax Island, Hollandsbird Island, Ichaboe Island, Mercury Island, North Long Island, Penguin Island, Plum Pudding Island, Pomona Island, Possession Island, Seal Island, Sinclair Island and South Long Island. Of the thirteen islands only Hollandsbird (the northernmost island in the group) and Possession islands are shown on the *National Geographic Atlas of the World*. These islands are administered by the Cape Province.

This application for separate country status is based on the islands being more than 75 miles from the closest point in South Africa (and Walvis Bay). The application is very well done and looks very convincing.

Following immediately after the application for separate country status, DK9KX announced a DXpedition to the Penguin Islands, which was scheduled to begin July 14. The list of operators included: DF9KH, DK9KX, DL8CM, V51DM and ZS9A. The announced callsigns were DL8CM/ZS1 on CW, DK9KX/ZS1 on SSB and ZS9A/1 on 50 MHz. This operation probably took place from Seal Island, which is located just north of Luderitz. The first announcement mentioned a ZS0 prefix, but later information received from DK9KX said they would be operating portable ZS1 instead.

Grosse Ile, Canada

Martin VE2EDK and Dany VE2EBK submitted an application for Grosse Ile, Canada. Grosse Ile is located in the St. Lawrence River near Montmagny, 29 miles downstream from Quebec. The island is shown on road maps.

Their application is based on several factors: separation by foreign land, under the controversial Point 3(b) of the DXCC Countries List Criteria; and an implied relationship with the DXCC countries of Sable Island and St. Paul Island, because all three are under the jurisdiction of the Canadian Federal government and not administered by any province. You may recall that the recently denied application for country status for Tatoosh and Guemes Islands was based on this same Point 3(b) and that the DXAC is considering a rewrite.

7K1-7N1: New Japanese Prefixes

With the availability of "J" prefix callsigns rapidly diminishing in the prefectures of Chiba, Gumma, Ibaraki, Kanagawa, Saitama, Tochigi, Tokyo and Yamanashi, new callsign prefixes have been authorized. The new callsign prefixes for applicants will be 7K1, 7L1, 7M1 and 7N1 (the 7J callsign prefix has been designated for foreign reciprocal licensees). The authorities are already issuing callsigns in the 7K1 series and the other prefixes will follow as use dictates. Thanks to *JARL News*, *The Totem Tabloid* (bulletin of the Western Washington DX Club) and Bob KE7GL.

The Red Sea Islands

As I am writing this month's column, the question of whether or not the Abu Ail Islands will be deleted from the countries list remains unresolved, or at least no action has been taken. The popular opinion is that the islands ceased to be valid for separate country status on March 31, when Yemen took control of the lighthouse, but the *DX News Sheet* thinks otherwise. The following paragraphs, adapted from *DX News Sheet*, provide an interesting argument for retaining the islands on the DXCC countries list and give background information about the Red Sea Islands:

There have been many rumors circulating the DX bands about the status of Abu Ail and Jabal at Tair following the recent DXpedition by the DL operators. Even suggestions that they have already been deleted from the DXCC list!! Here are some excerpts from the official press release about the matter, issued by the United Kingdom Department of Transport on October 16, 1989, which make it clear that such action would be premature:

The UK's resignation as Managing Government of and as a party to the Red Sea Lights Agreement was announced today. The Agreement covers the operation of two navigation lights in the Southern Red Sea, managed by the UK on behalf of the 15 contracting governments.

Following a recent review, most signatory Governments to the Agreement concluded that the lights are no longer needed for their international shipping. The British Government shares this view and accordingly has resigned its position as Managing Government to take effect 31 March 1990. Its withdrawal from the Agreement as a participating Government will take effect from 31 March 1991. If no successor managing Government is appointed by the contracting Governments, the Agreement will lapse before that date.

The position locally has now changed unexpectedly in that the lights administered by the Red Sea Lights Company, which acts as the UK's managing agent, are no longer operating. Other lights are now operating at the same locations, and these are understood to have been put up by the Yemen Arab Republic. Accordingly, the UK has advised other signatory Governments that the lights now operating are not the responsibility of the UK and other signatory Governments of the Red Sea Lights Agreement.

The lights at Jabal at Tair and Abu Ail were among four built by the Ottoman Empire and first exhibited in 1903. Turkey renounced her rights and titles to the islands in the Treaty of Lausanne, and their sovereignty has since remained undetermined. The two lights have been managed by Britain since 1915, when the former Turkish islands were occupied by the Royal Navy during the first World War. For a period in the 1930s Germany, Italy and the Netherlands contributed to the costs of managing the lights, but this ended with the second World War.

The post war international cost sharing agreement was reached in 1962, with Britain taking the role of Managing Government, and is based on participating countries' share of the shipping tonnage through the Suez Canal. In recent years the management of the lights has been undertaken by the Red Sea Lights Company. The contracting Governments under the Agreement are Denmark, China, Egypt, West Germany, Greece, Italy, Kuwait, Liberia, Netherlands, Norway, Pakistan, Sweden, USA, USSR and the UK. The Yemen Arab Republic is not a party to the International Agreement.

Sovereignty over Abu Ail (and Jabal at Tair) is still not determined and is not directly affected by the cessation of the UK interest in the lighthouses. The new lights mentioned in the press release as having been erected by the YAR strengthen any YAR claim to sovereignty, but it is not clear what court or body would validate such a claim (apart from the signatories of the Treaty of Lausanne, who have probably lost interest).

The bottom line is that the islands should continue to count for DXCC until YAR, or one of the other nearby states, makes a claim that is supported internationally." 73

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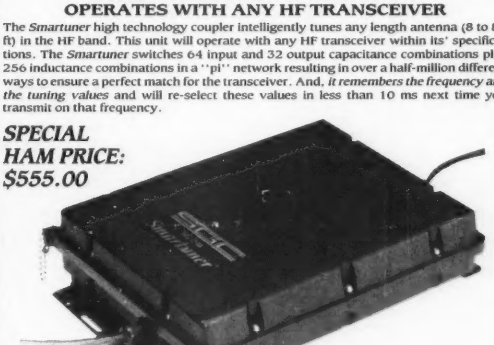

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Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

SEP 1-2

KELOWNA, BRITISH COLOMBIA The Okanagan Valley Ham Fair Society will hold a Ham-Fair at Camp Dunlop (150 miles N.W. of Spokane WA). Talk-in: 146.92 Penticton, 146.82 Kelowna, 146.88 Vernon. Contact *Orin Beebe VE7BEE, Box 477, Penticton B.C. V2A 6K6, Canada* or *Doug McIntyre VE7APS at 764–8637.*

ALAMOGORDO, NM The Alamagordo ARC will hold their Sixth annual Hamfest at the Otero County Fairgrounds Sat. from 8 AM–5PM, and Sun. from 8 AM–2 PM. VE Exams. RV parking. Free admission. Tables $5 per day. Pre-registration for door prizes $5 (before Aug. 31), $6 at the door. Talk-in: 146.20/.80 repeater. For info call *(505) 437–0298 or (505) 437–0992.* For exam info call *"Ole" WA5IPS, (505) 437–5896.* Mail registrations to *June K5BHE, PO Box 276, Alamogordo NM 88311*

SEP 2

INDIANAPOLIS, IN Central Indiana Hamfest/Computerfest, brought to you with the help of the Ivy Tech ARC, will be held at the East Pavilion Building at the Indiana State Fairgrounds from 8 AM–4 PM. Admission $3 in advance, $4 at the door. Accompanied children under 12 free. Free parking. Booths with tables $10 each. Booths without tables $5 each. Send reservations before Aug. 15th to *Leo Doyle KE9TS, PO Box 20158, Indianapolis IN 46220.* For info call *(317) 251–9833 or (317) 352-0136*

SEP 8

LAPORTE, IN The Laporte ARC and the Michigan City ARC will hold a Hamfest Sat. at the Laporte County Fairgrounds. Talk-in: 146.52 simplex. Forums include the Midwest Microwave Society's construction exhibit and seminar (bring your SHF projects). Donation is $3.50. Table charge is $3.50. Reserve in advance by SASE to *LPARC, PO Box 30, Laporte IN 46350.*

FORT WAYNE, IN The Summit City Hamfest, sponsored by the Fort Wayne Radio Club will be held at the 4-H Fairgrounds on Carroll Rd. from 6 AM–3 PM. Free parking. Set-up 6 PM Friday. Advance admission $3, $5 at the door. Tailgating $7. Table/chair/open air building $10 (by reservation). Table/chair/electricity/ enclosed A/C bldg. $15 (by reservation). Talk-in: 146.16/.76, 222.88/224.48, 449.875/444.875. Contact *Frank Jaworski K1FJ, 3923 Oakleaf Dr., Fort Wayne IN 46815. (219) 485–2634.*

UNIONTOWN, PA The W3PIE Uniontown ARC, Inc. will hold its 41st annual Gabfest on the old Pittsburgh Rd. Free parking. Free Swap & Shop set-up with registration. Pre-registration $4 each or 2/$5. Talk-in: 147.045/.645 and 144/57/145.17. Contact *John T. Cermak WB3DOD, PO Box 433, Republic PA 15475. (412) 246–2870 or (412) 246–9383.*

SEP 9

BUTLER, PA The Butler County ARA, Inc. will sponsor their 13th annual Hamfest at the Butler County Farm Show Grounds at Roe Airport from 9 AM–4 PM. Free outside Flea Market. Indoor vendor's space $10 per 8' table. Admission $1, children under 12 free. Mobile check-in till noon 146.52 (W3UDX) simplex. Directions 147.96/.36 (W3UDX). Overnight Camping. Handicap parking. Fly-in (Butler-Roe Airport) 122.7 MHz. For info contact *Chairman, PO Box 1737, Butler PA 16003-1787.* To reserve indoor table space contact *Joseph Stahlman WA3BVG, Box 8815, R.D. 5, Slippery Rock PA 16057, (412) 794–8383.*

FINDLAY, OH The Findlay RC will hold its 48th annual Hamfest at the Hancock County Fairgrounds beginning at 8 AM. Advance tickets $4, $5 at the gate. Set-up at 6:30 AM. Tables are 8' x 32". First table $12 (includes admission for one), additional tables $8. Reserve before Sept. 1st. Reserved tables held until 9 AM then resold if unclaimed. Talk-in: 147.75/.15. Send payment and SASE to *FRC Tables, Box 587, Findlay OH 45839.* Make checks payable to Findlay Radio Club. For info call *(419) 423-1190.*

MONETT, MO The Ozarks ARS will hold its annual Club Congress & Swapfest at the Monett (Missouri) City Park beginning at 9 AM. Bingo at 10 AM. Pot-luck Dinner at 12:30 PM. The park is located at the junction of State Hwy 37 and US Hwy 60. Talk-in: 146.37/.97. Contact *The Ozarks ARS, PO Box 327, Aurora MO 65605, (417) 678–3375.*

JOLIET, IL The Bolingbrook ARS will hold its sixth annual Ham/Computer Fest at the Inwood Recreation Center. Dealer Setup: Sat. 3–6 PM, Sun. 5 AM. Gates open at 6 AM, indoor stadium opens at 8 AM. Advance tickets $3. Reserved dealer tables indoors $10. Reserved flea market tables indoors $5. VE testing. Talk-in: 147.33 +0.6, 224.54 −1.6, 146.82 −0.6 MHz. For info call the BARS Hotline *708) 759-7005.* For advance ticket reservations mail check to *Bolingbrook ARS, PO Box 1429, Bolingbrook IL 60439-7429.* For table reservations contact *Ed Weinstein WD9AYR, 7511 Walnut Ave., Woodridge IL 60517. (708) 985–0527.*

WEST HARTFORD, CT The University of Hartford Computer Fair will be held from 10 AM–4 PM at Sport Center. Admission $5. Contact *Cogan, One Magnolia Hill, West Hartford CT 06117. (203) 233–9922.*

SEP 14-16

VIRGINIA BEACH, VA The Assoc. of North American Radio Clubs' convention will be held at the Virginia Beach Pavilion, in conjunction with the Tidewater Radio Convention's 15th annual Hamfest/Computer Show. WNIS-AM, Newsradio 850, is the convention sponsor. The Old Dominion DX Assoc. is coordinating the convention. For info contact *ANARCON '90, Box 9645, Norfolk VA 23505-0645.* Telephone ANARC at *(804) 499–1191* or *(804) 877–4969.*

SEP 15

CALGARY, ALBERTA CANADA The Sixth annual Calgary Ham Radio Flea Market will be sponsored by the NOVATEL ARC at the Parkhill Community Centre from 0900–1300. Admission $2. Tables $2. Talk-in: VE6NRC 146.76; simplex 146.52. To reserve a table, send your name, callsign and $2 to *NOVATEL ARC, 1020 64th Ave. N.E., Calgary Alberta T2E 7V8, Canada.*

CAMBRIDGE, MA TAILGATEELECTRONICS/COMPUTER/AMATEUR RADIO flea market sponsored by the MIT Radio Society and the MIT Electronics Research Society, will be held from 9 AM–2 PM at Albany and Main St. Admission $1.50. Free off street parking. Tailgate room. Sellers $5 per space in advance, $8 at the gate. Includes 1 admission. Set-up 7 AM. For reservations call *(617) 253–3776.* Mail advance reservations before the 5th to *W1GSL, PO Box 82 MIT BR, Cambridge MA 02139.* Talk-in: 146.52, 449.725/444.725—pl 2A—W1XM/R.

SEP 15-16

PEORIA, IL Hamfest/Computer Fair, ARRL Illinois State Convention, sponsored by Peoria Area ARC at the Exposition Gardens. Flea Market from 6 AM–6 PM. Camping and free parking. Banquet at 7 PM Sat. night by reservation. Admission ticket good both days. $4 advance, $5 at the gate. Advance sales close Sept. 13th. Enclose SASE, and make check payable to *Peoria Area ARC, PO Box 3461, Peoria IL 61614.* Talk-in: 146.76/.16.

VIRGINIA BEACH, VA The Tidewater Radio Conventions, Inc. will hold the ARRL Roanoke Division Convention and the ANARC 1990 SWL Convention at the Virginia Beach Pavilion from 9 AM–5 PM. Admission $5 in advance, $6 at the door. Talk-in: 146.970/−300. Contact *Manny Steiner K4DOR, 3512 Olympia Lane, Virginia Beach VA 23452. (804) 340-6105.*

SEP 16

PENNSAUKEN, NJ The South Jersey RA will hold its annual Hamfest at the Pennsauken High School. Gates open at 8 AM. VE Exam registration is at 9:30. Tickets are $3.50 in advance, $4 at the door. Vendor tickets are $5 per table plus the cost of admission. Talk-in: 145.29/144.69 K2AA repeater. For info and tickets contact *Jim McGrath KB2IYS, 2 Dickens Lane, Mt. Laurel NJ 08054 or (609) 866-0890* after 6 PM EDT.

OLD WESTBURY, NY The Long Island Mobile ARC will hold a Hamfest at the New York Inst. of Tech. from 9 AM–4 PM. Admission $5 at the gate. Exhibitors $8. Talk-in: 146.25/.85. Contact *Neil Hartman WE2V, (516) 462–5549* or *Mark Nadel NK2T, (516) 796–2366.*

Near CONCORD, NH, off Interstate 89 The Contoocook Vally RC is sponsoring its Fall Ham Radio/Electronic Flea Market 14 miles from Concord NH. Sellers set-up at 8 AM, cost is $5. Buyers arrive anytime, cost $1. Contact *Dave K1OPQ at: WA1WOK-2/BBSWOK, or (603) 746–5090.*

CANFIELD, OH The 20/9 ARC will sponsor a Flea Market at the Mahoning County Joint Vocational School from 9 AM–4 PM. Set-up at 6:30 AM. $1 per space. Dealer tables $6 per 8'. Admission $2 at the gate. Handicapped accessible. VE Exams at 1 PM. Talk-in: Mobile check in until 1 PM on 147.315 and 145.270. Reserve in advance by contacting *Paul Resch, (216) 793–8352* or *David Spencer, (216) 544–3723.*

VERNON, CT The Hartford Hamfest will be held ½ mile from I84, exit 67. Tables, (bring your own) $8 in advance, $10 at the door. Rent-a-table, reservations only, $15. Tail gate, advance $5, $7 at the door. General admission $3. Dealers 8 AM; public 9 AM. Contact *Phill Davis WF1O, 45 Marshall Rd., Manchester CT 06040. (203) 649–1624* (evenings). ARRL/VEC exams at 9 AM. Contact *Joe Faraci WD1U, 190 Richmond Rd., Coventry CT 06238. (203) 742–7625 (evenings).*

SEP 21

VERONA, NY The Madison-Onieda ARC holds VE Exams the third Friday of every month at the Madison-Oneida BOCES on Spring Rd. Take I90 to Exit 33, RT 365 North two traffic lights, turning right at the second light. Time is 7 PM. Talk-in on 145.37. Contact *Leonard Popyack WF2V, (315) 853–8974,* or on *146.79, 145.37, WF2V @ WA2TVE, or POPYACK@TOPS20.RADC.AF.MIL.*

SEP 21-23

GAYLORD, MI The Chain of Clubs will be hosting the 1990 ARRL State Convention at the County Fairgrounds. White Fish Fry, Wouff Hong, Fri.; Flea Market, Banquet, Sat.; Church services, VE Exams Sun. Admission: $3 advance, $5 at the door. Commercial vendors: $15 first table, $10 second table. Noncommercial: $5; Tailgate: $3. Talk-in: 147.12+. Reservations for VE Exams, contact *Jim Toler WM8T, 3070 Van Tyle, Gaylord MI 49735. (517) 732–7748.* For further info: *Chain of Clubs. PO Box 4073, Gaylord MI 49735.*

SEP 22

Between POLK & FRANKLIN, PA The Ft. Venango Mike & Key Club's Ham Auction will be held at the Venango County 4-H Fairgrounds (Route 62) beginning at 9 AM. Free parking. Registration of auction items at 8 AM. Auction begins at 10 AM. Admission $2. $1 for pre-registered sellers. Contact *Jim Clinefelter N3BAT, (814) 437–1781* or *Bruno Wolozyn K3MHB, (814) 677–8694.* Or write the club at: *Ft. Venango Mike & Key Club, R.D. #1, PO Box 591, Cranberry PA 16319.*

BERLIN, VT The Central Vermont ARC will hold its second annual Fall Foliage Hamfest/ Fleamarket at the National Guard Armory from 9 AM–3 PM. VE Exams at 1 PM, walk-ins welcome. Handicapped accessible. Admission $2, Tailgating $4. Tables (provided) $6 advance, $8 at the door. Talk-in: 146.625. Contact *Todd Bigelow, PO Box 524, Williamstown VT 05679. (802) 433–5587.*

SEP 22-23

MOBILE, AL The MARC Hamfest/Computer Show will be held at Abba Temple Fair Grounds from 9AM–5 PM Sat., and 9 AM–4 PM Sun. Self contained RVs welcome. VEC Exams at 10 AM Sat. Talk-in: 22/82 and 34/94. Admission $3. XYLs and children free. Tables $8 for one day, $10 both days. Hospitality room at the Family Inn. Mail registrations to *MARC, PO Box 9315, Mobile AL 36691-0315.*

GRAYSLAKE, IL The Chicago FM Club will sponsor RADIO EXPO 90 at the Lake County Illinois Fairgrounds. VE Exams. Indoor Flea Market tables & electricity available. Overnite security. Camping. Admission: $4 advance, $5 at the door. Talk-in: 146.16/.76. Contact *Mike Brost WA9FTS, PO Box 1532, Evanston IL 60204.*

SEP 23

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot-Flushing Meadow Park, beginning at 9 AM. Set-up after 7:30 AM. VE Exams at 10:30 AM and 12:30 PM. Donation: Buyers $3, sellers $5 per space. Talk-in: 144.300 simplex link, 223.600 repeater, 445.225 repeater. Call (at night) *Steve Greenbaum WB2KDG, (718) 898–5599* or *Phil Kubert N2HYE, (212) 777–8648.*

DANBURY, CT The Candlewood ARA will sponsor a Flea Market at the Elk's Club from 8 AM–3 PM. Set-up at 7 AM. Admission $4, kids under 12 free. Tables $8. Tailgating $6 (includes 1 admission). Talk-in: 147/72-12. For info call *(203) 790–7987; (203) 775–6738; (203) 426–1652.* Send check payable to *C.A.R.A, c/o Bob Elton, 60 Padanaram Rd. #18, Danbury CT 06810.*

SEP 29

HORSEHEADS, NY The Elmira ARA will hold the 15th annual Elmira International Hamfest/Computerfest at the Chemung County Fairgrounds from 6 AM–4 PM. Free parking. Camping hookup $8 (County requirement). Admission $3 advance, $4 at the door. Children 10 years or younger free. Talk-in: Rookies repeater 147.36/.96; 444.20. Tickets contact: *Dave Lewis, RD#1 Box 191, Van Etten NY 14889.* Dealers: *Jay (607) 733–0761.* VE Exams: *Bill, (607) 962–1134.*

SEP 30

BENSON, NC Johnston ARS will hold the second annual JARSFEST 1990 at the American Legion Complex. Advance admission $4, $5 at the door. Flea Market space and indoor tables. Contact: *Johnston ARS, Rt. 1 Box "JARS", Benson NC 27504,* or call *(919) 894–5479, 7 PM–9 PM.*

SPECIAL EVENT STATIONS

SEP 1-3

PARADISE, AZ The Cochise ARA will operate WA7KYT from Ghost Town, around the clock from Sat.–Mon. Frequencies: CW—7.040; Phone—3.885, 7.285, 14.288, 18.150, 21.288, 28.385, 6 M. For special certificate send 9 x 12 SASE to *Cochise ARA, PO Box 1855, Sierra Vista AZ 85636.*

WATERFORD, CT The Tri-City ARC will operate station KA1BB from Sat. at 1700Z–2300Z Mon. at the Waterford CT I-95 Weigh Station to promote safe Labor Day holiday auto travel. This event is in conjunction with the seventh annual Stay-Awake Coffee Stop offered by BSA Troop 24 of Niantic CT. Frequencies: The middle of the 80, 40, 20 and 15 M General Class phone and CW bands. Talk-in to Coffee Stop on FM 146.52 direct and CB channel 19. QSL with letter size SASE via *Tri-City ARC, PO Box 686, Groton CT 06340.*

SEP 1-9

ROLLING MEADOWS, IL Operators from the Rolling Meadows ARC and its sister city, Henin-Beaumont, will celebrate the 35th anniversary of the Founding of Rolling Meadows. Frequencies: Phone—up 15 kHz in General bands; CW—up 45 kHz from bottom of band. Novice activity is also planned for both modes. Stations will use personal calls. Phone stations will announce, and CW stations will identify with "RMI" tag. 10 through 80 meters. QSL with SASE to *Bob Lynn W9PYA, 3802 Jay Lane, Rolling Meadows IL 60008.*

SEP 3-8

ATLANTIC CITY, NJ Southern Counties ARA will operate K2BR from the Miss America Pageant from 9 AM EST. Phone: 25 kHz

inside lower General Class bandedge. CW: 65 kHz inside lower General Class bandedge. Novice: 28.100–28.500 MHz. QSL: SASE #10 via *SCARA, PO Box 121, Linwood NJ 08221.*

DAVENPORT, IA The Palmer College of Chiropractic ARC, in cooperation with the Davenport RAC, will sponsor a Special Events Day, commemorating Chiropractic Founders Day at Palmer College, and the original site of broadcast station WOC, which was Ham Radio—9BY in the early 1900s, prior to obtaining the present call letters of WOC. Operation will be from 1300Z to 0100Z. Frequencies: 10 kc up from the bottom of General portions of each band. For certificate send QSL and a No. 10 SASE, for QSL card send std SASE to *Dr. Wayne Henry Zemelka KBØCIO, 1000 Brady St., Davenport IA 52803.*

SEP 22–23

BUTLER, PA The Butler County ARA will operate W3UDX from approximately 1300Z–0400Z on Sat. and from 1800Z–0000Z Sun., to commemorate the 50th anniversary of the First General Purpose vehicle (Jeep). Frequencies: lower portion of 80, 40, 20 and 15 M General phone bands and Novice 10 M phone and CW. Also on 147.96/.36 and 146.52. For unfolded certificate send QSL and 9 x 12 SASE to *Butler County ARA, Box 1787, Butler PA 16003.*

SEP 28–30

PEA PATCH ISLAND Historical Ft. Delaware DXpedition on Pea Patch Island (I.O.T.A. # Pending). The Tristate IARC will hold a weekend DXpedition outing courtesy of the Delaware State Park Commission. SSB operation on the General portion of 40, 20, 15 and Novice 10 M. Also, 2 and 6 M. Operators will be KA3PVT, KA3PFH, N3EMY, KA2RRK and W2BN. QSL direct to the appropriate operator by SASE.

BRANCHVILLE, SC The Edisto ARS will operate AD4U from 10:00–22:00 EDST Sat. and 13:00–18:00 EDST Sun. Frequencies: 28.400, 14.285, and 21.375 (±). Send QSL and SASE for impressive 8½ x 11 certificate to: *AD4U, PO Box 117, Branchville SC 29432-0117.*

SEP 30

KINGWOOD, WV Preston County amateur radio operators will operate WM8E from 1400Z Sept. 28–0200Z Sept. 30, in celebration of the 49th annual Preston County Buckwheat Festival. Operation modes will be phone or CW on 40, 20, 15 and 10 M. Contact may be made approximately 25 kHz up from the bottom of General phone bands or Novice CW bands. For certificate, send QSL and SASE to *John Wills KE8NO, 104 Swartz Rd., Kingwood WV 26537.*

SEP 30–OCT 1

SANDIA PARK, NM Fall Classic and Homebrew Radio Exchange, will be sponsored by the Classic Radio Newsletter, from 2000Z–0400Z. Our object is to restore, operate and enjoy homebrew equipment and equipment at least 10 years old (not required for entry). The same station may be worked multiple times with different equipment on each band/mode. Frequencies—Phone: 3880, 7290, 14280, 21380, 28320; CW—60 kHz up from lower bandedge; Novice/Tech—3720, 21120, 28320. (Most of the action is on 7060 and 3560.) Add number of all transmitters and receivers worked plus the different states/provicences/countries worked per band/mode. Multiply by total age of all your transmitters and receivers used (minimum three QSOs per unit). For transceivers, multiply age by 2. For homebrew, count as 25 years unless older. Sporadic awards. Mail logs, comments, plus SASE for Newsletter to *Jim Hanlon W8KGI, PO Box 581, Sandia Park NM 87047.*

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± 5 Mhz @ 450 Mhz: 50db (60db GaAs) ±20 Mhz @ 950 Mhz: 70db

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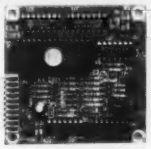

NEW Model ID-2B

The ID-2B provides required station identification without troublesome diode programming. The "ID over voice inhibit" circuitry allows for courteous operation by not allowing an ID until the next squelch closing.

ID-2B Wired/Tested $99.95 **ID-2B-LP Low Power $109.95**

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UPDATES

T.D. Systems' Address

The correct address for T.D. Systems is 2420 Superior Drive, Suite B, Pantego TX 76013. The street number, 242C Superior Drive, as given on page 49 of the August 1990 issue, is incorrect.

C-64 & 1541 Drive Conversion

Now a letter from John M. Franke WA4WDL of Yorktown, Virginia: "I enjoyed K6YDW's article, 'C-64 & 1541 Drive 12-Volt Conversion,' in the July 1990 issue. There is one small mistake that is not overly important but is repeated by many amateurs. Mr. Neeley uses a frequency counter having 'at least seven digits' to set the MM5369 oscillator to 3.579545 MHz. While that is the color burst frequency, the chip does a divide by 59,659, which would indicate that the oscillator should be trimmed to 3.759540 MHz.

"By the way, the instruction sheet for the Ramsey TB-6 also states that the correct frequency is 3.579540, not 3.579545 MHz. The output frequency if you use the wrong frequency is 60.000084 Hz. But if you are going to use a seven-digit counter, you might as well adjust the oscillator to the correct frequency."

New Kenwood Service Number

Kenwood has a new toll-free service number for amateurs requesting parts: (800) 637-0388. National Service Manager Joel Berger says that the new number "...is designed to make the purchase of parts as easy as possible for our customers."

The toll-free service will be available from 9 a.m. to 6:30 p.m. EST, Monday through Friday. FAX service is available at (516) 483–5904. Local customers should call the local number.

Variac Danger

In the June 1990 "Ask Kaboom," it's stated that a variac can be used in lieu of an isolation transformer. A variac is an autotransformer and does NOT provide any isolation or protection to the operator. The danger of shock is not eliminated with a variac. *Thanks to Ted Heuer WA2RGB of Rosedale, New York, for this information.*

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See system variables, control & reprogram all via packet!
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Add duplex tel. Remote Base control & 3 way patch..TLCN.. $159.95
External relays; 3 DPDT relays +5 Open Col. Trans. Sw....CS 8..$89.95
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*EPROM Autoboot CART....$109.95
*C64 & 1541 12V.Switching supply crystal controlled ...DCPS...$129.95
*Digital Voice Rec/PB 32 or 64 sec. voice Mailbox & ID Tail.DVM $179.95
*Manual (REFUNDED).MN1..$ 20.00

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Allows H.T. to scan 100 Channels & programs
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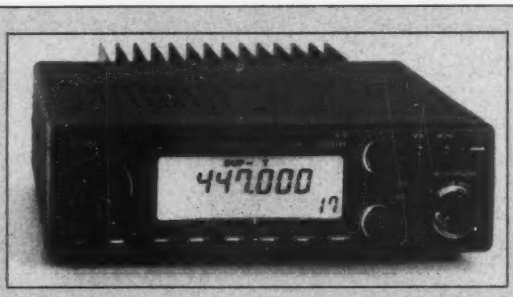
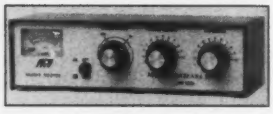


PRODUCT OF THE MONTH

ICOM

The new IC-3220A/H from ICOM is a small dual-band FM mobile transceiver. The IC-3220H offers 45 watts output on 144 MHz and 35 watts on 440 MHz; the IC-3220A gives 25 watts on both bands. These compact transceivers measure 5.5" x 1.6" x 7.7". Illuminated controls give you complete operating versatility at night. There are 36 memory channels (18 for each band), two call channels and two scan edge channels. The HM-56 hand microphone is an added bonus, with 14 DTMF memory channels convenient for autopatching. In addition to full duplex telephone-style QSOs, these transceivers receive both main and subband signals simultaneously. A built-in duplexer provides easy dual-band antenna connection.

The suggested retail price for the IC-3220A is $660; $700 for the IC-3220H. Contact *ICOM America, Inc., 2380 116th Ave. N.E., P.O. Box C-90029, Bellevue WA 98009-9029. Phone: (206) 454–8155 or (800) 999-9877.* Or circle Reader Service No. 201.



MFJ

MFJ has released a new 440 MHz antenna tuner, the MFJ-924, with a built-in SWR/wattmeter. The MFJ-924 handles power up to 200 watts. Its compact size (8" x 2½" x 3") and wide impedance matching range make it an excellent choice for mobile and/or base operation. It also features SO-239 input and output connectors and a wing nut post for ground. The SWR/wattmeter shows power on 30 or 300 watt scales and SWR.

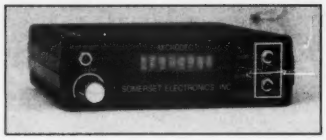
The MFJ-924 is priced at $70. Contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762. Phone: (601) 323–5869; FAX (601) 323–6551; Telex 53 4598 MFJSTKV.* Or circle Reader Service No. 202.

VIS STUDY CARDS

VIS Study Cards for Amateur Radio provide a simple way to study for the written tests at all levels, Novice through Extra. This system provides a complete set of flash cards for each examination element. Each question, along with its correct answer, appears on one side of a card, with the key words in both the question and the answer underlined. The reverse side contains the question and all four multiple choice answers from the VEC question pool (to be used during the learning process as a self-test). This study system helps the ham-to-be or upgrade candidate overcome the fear of tests and gain confidence and knowledge quickly and easily, and without using a computer!

For prices and more information contact *VIS Study Cards. P.O. Box 16646, Hattiesburg MS 39402. (601) 261–2601.* Or circle Reader Service No. 207.

SOMERSET ELECTRONICS



The MICRODEC™ multimode decoder from Somerset Electronics decodes Morse Code, Radioteletype (all standard shifts) and ASCII. It comes with these standard features: an intelligent, 8-segment LED dot matrix display with intensity controls; an ASCII serial computer/printer interface; an internal code practice oscillator; an internal speaker with volume control; and simplified push-button operation. It operates on DC voltages from 9 VDC to 15 VDC. It can be powered by a car, boat or any type of negative ground DC power source.

The standard display color is high-efficiency green, with red and yellow displays available as optional features. Display intensity controls provide exceptional readability and clarity under various light conditions. A 120 VAC/12 VDC power adaptor is standard. There is also an optional battery pack/charging circuit.

The list price for the standard unit is $230, with an introductory sale price of $200, plus $8.50 for domestic ground shipping and handling. Contact *Somerset Electronics, Inc., 1290 Highway A1A, Satellite Beach FL 32937. (407) 773–8097.* Or circle Reader Service No. 205.

SPI-RO

Spi-Ro Manufacturing, Inc. is now offering a high performance 2 meter base station antenna that has 4.5 dB gain with an omnidirectional pattern. This 4.5 dB gain feature more than doubles the transmitter output power (effective radiating power) and the receiver sensitivity.

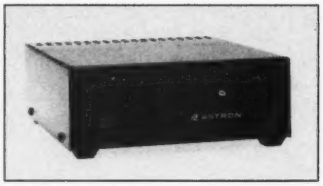
The VHF-45 covers 144–174 MHz and needs no ground plane or radials. Its heavy-duty construction, with 6061-T6 seamless aluminum and all-stainless-steel hardware, provides years of maintenance-free service. The VHF-45 will handle 250 watts. It has 50 ohm impedance and is DC grounded for lightning protection.

The VHF-45 is priced at $90 and is available from *Spi-Ro Manufacturing, Inc., P.O. Box 5500, Dept. 105, Lakeland FL 33807. (813) 646–7925.* Or circle Reader Service No. 204.

CONTACT EAST

The new supplement to the Contact East General Catalog is a reference guide for engineers, managers and technicians. It offers a wide range of reliable brand-name products for testing, repairing and assembling electronic equipment. This update includes many new products: linear power supplies, analog/digital oscilloscopes, inspection products, soldering/desoldering equipment, temperature/humidity chart recorders, static protection products, and many other items. All products are described in detail with specifications, full color photos, and discounted pricing.

This supplement is free from *Contact East, 335 Willow Street, North Andover MA 01845. (508) 682–9844.* Or circle Reader Service No. 206.



ASTRON

Astron Corporation has introduced a low profile power supply, model SL-11A. The SL-11A has been specifically designed as a base station power supply for two-way radios. It is very well regulated and will provide 11 amps of current at 50% duty cycle. The power supply has foldback current limiting to protect the power supply from overload and short circuits. It also has an overvoltage protection feature in case the voltage exceeds a safe level. The SL-11A is available in black or gray.

Contact an Astron dealer for the price. *Astron Corporation, 9 Autry, Irvine CA 92718. (714) 458–7277.* Or circle Reader Service No. 203.

THE RF CONNECTION

"SPECIALIST IN RF CONNECTORS AND COAX"

Part No.	Description	Price
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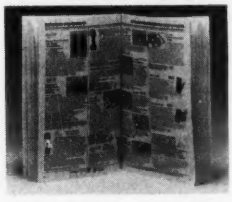

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ROBOT Research Still Alive

Sometimes this column works almost too well! A few months ago, I published the plea of Robert Dick K6YON who worried about the long-term health of his ROBOT 800 RTTY unit. Now, just as that request is being published, along comes the answer and, as Bob tells it, you'll never believe the source.

It seems that Bob mentioned to his wife that it was too bad that the ROBOT people had gone out of business. Bob says that "being a typical XYL *[?—Eds.]*, she picked up the telephone, asked information for the ROBOT phone number in San Diego . . . and got it!" ROBOT Research is still very much in business. While they no longer manufacture the ROBOT 800, nor any RTTY units, they assured Bob that they continue to service and repair them.

Readers who may need the information should contact ROBOT Research, 5636 Ruffin Road, San Diego CA 92123. Their telephone number is (619) 279-9430. Be sure to get in touch with them BEFORE you send them any equipment. Request a Return Authorization (RA) number for your equipment, and then relax.

An active RTTYer, Bob also passes along the information (accomplishment!) that he has worked Luxembourg, Italy, Germany, England, France, Sweden, Japan, and the USSR with 5 watts on 10 and 20 meter RTTY! Must have one hell of an antenna, Bob!

ASR-35, CoCo WEFAX, Tandys III & 4, Heath and HAL

This month's illustration of RTTY commitment comes from Ron Johnson WA5RON of Austin, Texas. Ron describes his setup as a classic Teletype Corporation ASR-35 in a current loop to a Lenkurt commercial TU. He built a remote transceiver control into the accessory panel, with a speaker, volume control, and transmit lock button, so that he can run the rig over a four-wire phone line. He does most of his communicating on 2 meter FM. As you can see, the teleprinter hardly ever needs service. Don't you just love action shots?

Now that we've solved a problem and had some fun, let's look at another ham's concern. Lisle T. Hines K2QLA of Homer, New York, relates buying a NOAA receiver. It works well enough for him to copy near overhead passes with no noise for at least 15 minutes on each pass. The receiver, from Hamtronics, is on 137.62 MHz, and it has a 30 kHz bandwidth.

His problem is that the CoCo WEFAX program will not copy a picture, but it will copy the picture borders. The signal seems to hang up at the 2300 Hz end of the scale. He wonders if the FM signal, modulated by AM, is just too much to ask the computer to copy. Lisle has no problem using the WEFAX program on HF and the like, copying hurricane pictures, but he would really like to try to make a go of it on the satellite. Any help from any of you would be appreciated. I'll print what I find out here.

Going from high tech to low, my regards to Domenic Mallozzi N1DM of Watertown, Massachusetts, who passes along the description of his station. Dom is running an old Model 15 page printer with a HAL ST-5 terminal unit and a home-brew AFSK. A Heath HW-101, from the vintage years of Heathkit, handles the RF end of the station, which is physically located in Rhode Island. I am sure the pile-ups multiply when N1DM hits the bands. Thanks for the info, Dom, and hope to see you on the air.

With old teleprinters often come old computers, and Tom Bright W2OHI of Bergenfield, New Jersey, has a few of them. Tom was using Tandy Model III and Model 4 computers in his office, and he has converted the office over to PC systems, freeing up the older computers for ham use. He wonders if anyone is still using these on the ham bands.

Communications Software

If you use any of the latest and greatest smart terminal units, a simple communications package may be enough to get either of these systems onto RTTY. While there were some packages available years ago for running RTTY with these computers, I don't believe any of them are still marketed. Of course, as always, your input is welcome.

Now for a look at some of the latest. Let's turn to good old MFJ Enterprises, Inc. A few months ago, I discussed their MFJ-1292 video digitizer, which enables you to use a video source as an input device for digitized pictures. Now they have come up with the MFJ-1289 MultiCom™ software for their MFJ-1278 Multi-Mode controller. This PC compatible software allows the transmission and reception of multi-gray level weather maps, wire photos, and SSTV pictures.

Other features of this program which enhance the controller include single key macros, quick setup of command parameters, an integral word processor, and even an alarm that lets you know when a specified call or sequence shows up. It's all wrapped up in a menu which allows access to external picture files, text files, and the like. Supplied on either 5¼" or 3½" inch disks, this copy-protected (Yechh . . . why?) software can be installed on a hard drive.

For more details, contact MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762. Or call them at (601) 323-5869. Do I have to remind you to drop "RTTY Loop's" name when you call?

Time to Tighten Up

I kind of omitted my usual monthly introduction at the top of this month's column, as I wanted to get right into the information on ROBOT Research. But as we look towards autumn, I want to say that this is an ideal time of year to go through the shack tidying up loose ends and tightening up all the outside connections for winter. And as you do all that, keep us in mind. Send along that idea, tip, question, or trick so that we can share the wealth with the multitude. Reach me, as always, by mail, at the above address, or via CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). And read about it right here, in next month's "RTTY Loop." 73

Ron Johnson at work on his RTTY station.

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On a recent trip out of town I heard RS-10 telemetry and transponder activity on a simple mag-mount 10 meter antenna with my mobile HF transceiver. Signals were quite good. Out of curiosity, I hooked up a 2 meter rig to another mag-mount and tried to access the ROBOT autotransponder. I could hear my signals getting through the satellite, with only 2 watts, to the simple quarter-wave mag-mount. Heather WB5RMA was not impressed since we were supposed to be touring the state capitol in Austin and I was more excited about CW from space.

Using the push-to-talk switch as a code key, I tried for a contact with the ROBOT. The ROBOT could hear the signals but couldn't understand the imperfect hand-sent CW. Signals were also good through the transponder during overhead passes, but the system was not easy to use.

However, here were most of the components for a good portable RS-10 Earth station. I had discovered that a simple receiver, handie-talkie and mag-mount antennas are all that's needed to make marginal contacts via satellite. For higher quality QSOs, some changes were necessary.

The primary transponder on RS-10 has a 2 meter uplink passband from 145.860 MHz to 145.900 MHz. The downlink can be heard from 29.360 MHz to 29.400 MHz. The telemetry beacon sends CW on 29.357 MHz and the ROBOT downlink is on 29.402 MHz. Signals are quite loud on most 10 meter rigs, even with simple antennas.

Since the days of AMSAT-OSCAR 7 and 8, I have configured several systems for mobile and portable work via satellite. This time I wanted a system that could be inconspicuously taken anywhere (a good idea in capitol rotundas), set up in a hurry and still make good quality contacts.

The experiment in Austin proved that for consistent operation, more power and better antennas would be needed on the uplink. The receive antenna was adequate but a preamp would have helped. And, since a complete station consists of several components, I needed something that would keep everything together and still be portable.

The Portable Solution

I gave an old briefcase new life, using it as the station, with a Uniden HR-2510 mounted on an aluminum plate that just fit in the case. A Santec LS-202A HT and a small home-brew amplifier filled out the space with just enough room for a small terminal strip, some Radio Shack snap-together toroid choke cores and a Janeil 10 meter preamp. A code key was friction-fit on top of the HT between the Uniden and the 2 meter amplifier. A speaker/microphone was included for voice activity. From the terminal strip, a power cable was attached with a standard cigarette lighter plug for mobile operation. Initial tests without the toroid chokes caused excessive desense in the 10 meter rig when using the amplifier and transmitting on 2 meters. Power output was near 25 to 30 watts. Instead of the simple quarter-wave whip used on 2 meters during the Austin experiment, I incorporated a Larsen ⅝-wave whip and got better results. The mobile Earth station was now complete.

Stationary activity from hotel rooms, campsites or roadside parks allows the use of a more effective 10 meter antenna. I rolled up a simple dipole with feedline attached and placed it in one of the briefcase pockets and used fishing line to hang the dipole from available structures. I also included another power cord with clips for connecting to a large gel cell or motorcycle battery when available.

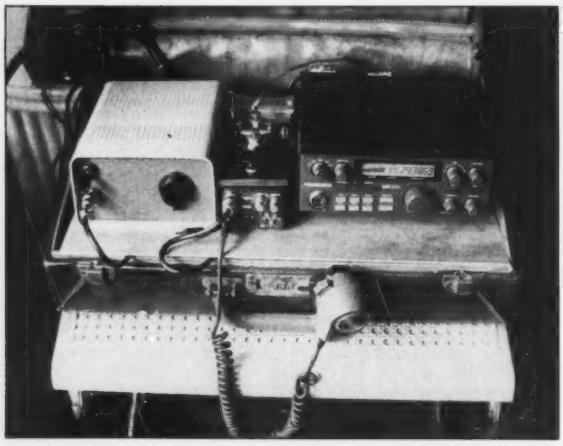


Photo A. A complete "RS" station in a briefcase—just add power and antennas.

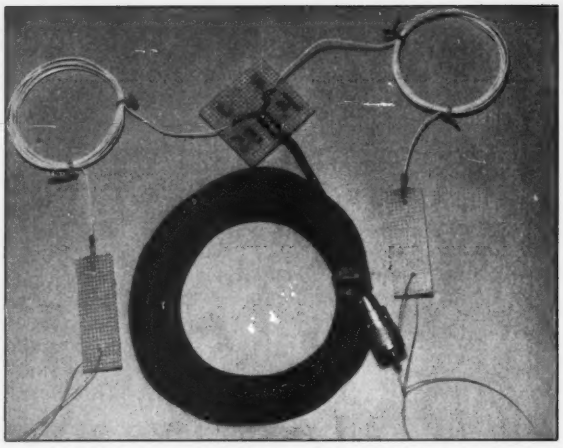


Photo B. A simple dipole works well for a portable "RS" station, and it is easy to install or store.

Configuring Your Own System

My Earth station in a briefcase used equipment I had on hand. The amplifier was originally for FM operation, but I used a few resistors and diodes to "linearize" it. The power transistors were biased slightly on, to respond properly to the SSB excitation. For CW work, this wouldn't have been necessary.

Some FM rigs have excessive chirp, but try a normal FM 2 meter rig for CW uplinking. If yours works, use it. Any power level from 25 to 50 watts output will do very well when used in conjunction with a ⅝-wave whip. Ten watt rigs will work but they will not provide consistent signals on low-horizon passes. Multimode rigs are best. They have the advantage of SSB for voice operation. A Kenwood TR-751A or a Yaesu FT290R-II will do extremely well.

For the 10 meter downlink, the Uniden HR-2510 or 2600 will provide satisfactory results even though there is only adequate selectivity on these units. Sensitivity is good since the radios are designed for 10 meter operation. Unlike the crowded conditions on the low end of 10 meters, activity is spaced more evenly in the RS-10 downlink. The only problem is the loud signals from FM stations making terrestrial contacts without regard to the satellite subband. Experiments with home-brew 10 meter direct-conversion receivers would be interesting, since only a small portion of 10 meters need be received.

A preamp is not always necessary, but it can help when the satellite output is down or you are using a very small receiving antenna. Advanced Receiver Research and Hamtronics have some inexpensive preamps. Building one from *The ARRL Handbook* is another alternative.

Photo C. Mike WA5TWT checks an "RS" pass using the portable station while on a fishing trip to central Texas.

Almost anything will work for transmit antennas. During mobile operation the ⅝-wave mag-mount is preferred, but a collinear or quarter-wave whip will also do. On the downlink, a modified CB mag-mount is an excellent choice. Usually the only alteration necessary is to remove one or two turns of the upper coil in the antenna base to change the antenna's resonance from 11 meters to the upper portion of 10 meters. Another good downlink antenna is the quarter-wave whip. A 102" CB antenna can be cut back a few inches very quickly. Commercial ham anten-

Photo D. For mobile "RS" work, a modified "CB" mag-mount placed away from the 2 meter uplink antenna does an excellent job.

nas, like the Hustler, would function equally well.

The uplink and downlink antennas for satellite work should be separated as much as possible to keep the transmitter from interfering with reception since operation is full duplex. You listen to your own signal as it is being retransmitted by the satellite. It may be necessary to locate the feedlines through different windows on a car, placing the antennas at opposite ends of the vehicle. Note that it is never a good idea to attempt satellite contacts while in motion, unless someone else is doing the driving.

The power to the radios may also need separation. The ferrite cores wrapped around the power lines to the transmitter and receiver are not always completely effective. One radio can be connected through the cigarette lighter while the other can be hooked directly to the battery. Radios that run from internal batteries may also help eliminate any desense problems. Once again, experiment to find the best configuration.

For more ideas on mobile satellite work, check the "Hamsats" column in the October 1987 issue of *73*. Further details on portable operation can be found in "Black Bag Portable," by Tom N6DGK, in the July 1989 issue of *73*. "Poor Boy Satellite Station," by Allan N5LKJ, in the December 1989 *73* supplies further data on simple-to-use and easy-to-construct satellite stations.

Microsats and DSP

DSP, or digital signal processing, has been around for many years but is now becoming more commonplace in amateur radio equipment, thanks to dedicated chips designed specifically for this purpose. The Advanced Electronic Applications DSP-1232 and DSP-2232 multimode data controllers are some of the first stand-alone units to become available to the ham radio market. Both are scheduled for release in September or October of this year.

The DSP-1232 provides two switchable ports while the DSP-2232 has two simultaneous ports. Anticipated prices are $700 to $900, respectively.

DSP translates an analog input into a digital form. It then provides digital filtering and processing based on software control. The result is that modems are not built from hardware components but instead are written as software programs that are executed by a generic DSP unit. For the AEA devices, a Motorola 56001 chip provides the heart of the system. The units will be able to generate and receive any mode that can be programmed, including RTTY, FAX, SSTV and all packet formats. For the Microsat and Fuji-OSCAR 20 chaser, the units promise to allow PSK downlink with Manchester-encoded AFSK uplinking. They will also provide operation via the 9600 baud UoSAT-OSCAR-14 digital communications experiment.

Like the first calculators or the early digital watches, DSP units are expensive. On the positive side, as more communications modes are devised, appropriate software for the units will likely be produced. AEA expects to have ROM upgrades available for about $30 when new software is written.

After a satellite pass is over, the box can do other chores since it is not tied to just one mode. The use of DSP in amateur gear promises to provide exciting possibilities for future ham activity. Other manufacturers (DRSI and L.L. Grace Communications Products, Inc.) are working on stand-alone DSP boxes and DSP plug-in boards for PC-compatible computers. They will be mentioned in future columns as the information becomes available.

For more information on the DSP-1232 and DP-2232, contact *Advanced Electronic Applications, P. O. Box 2160, Lynnwood WA 98036, (206) 775-7373.* 73

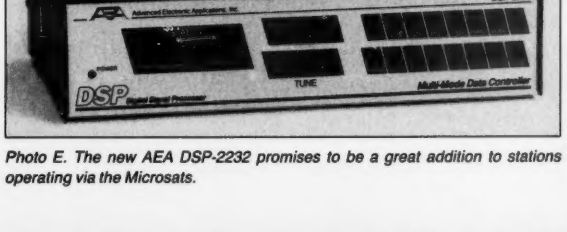
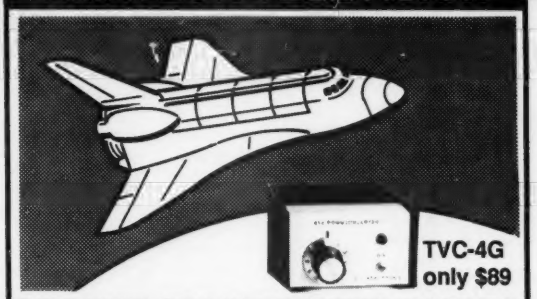


Photo E. The new AEA DSP-2232 promises to be a great addition to stations operating via the Microsats.

AMATEUR TELEVISION



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Quads with Class

For sensitivity, simplicity, and low cost, you can't beat a quad antenna for radio direction finding (RDF) on 144 MHz and up. Home-brew quads give excellent performance but they take some time and effort to build and, let's face it, sometimes their "primitive" look is not particularly pleasing on a car.

Before a fledgling hunter can assemble his new pride and joy, he has to scrounge all the parts, measure and cut everything to size, drill all the various holes, and figure out how to connect the coax at the feed point. I'm sure more hams would be out on VHF T-hunts if they knew how to avoid these quad-building chores, and could be assured of a good-looking end product.

I have searched for a long time for inexpensive commercial VHF/UHF quad kits that are suitable for mobile T-hunting and look good. Until now, all the designs have been either too flimsy for mobile use or much too expensive. (Would you believe $125 for 4 elements on 2 meters from one manufacturer?)

A Classy Answer

Bill Levey WA4FAT, who heads up Amateur Applied Electronics (AAE) of Birmingham, Alabama, is an avid T-hunter. Thus, it was natural that his company, which makes the classy-looking Bandmaster line of quads for VHF DXers, also develop antennas that can be used for RDF. AAE is encouraging the growth of foxhunting by selling a simple 2-element quad for only $30. You may not find it in the AAE ads, but it's "on the shelf": the "T-Hunt System," Model Q-144-2 (see Photo A).

These 2-element quads are popular for foxhunting in Birmingham because they are more sensitive than Dopplers, and they fit into the back end of a passenger car before and after the hunt, without disassembly. WA4FAT encouraged me to try one on some Southern California T-hunts.

AAE took care to select high quality materials. These quads will take punishment, whether on a high-speed mobile or on a house in an inhospitable climate. The boom is 1"-square exterior grade Fiberglas™, ⅛" thick. Spreaders are ¼"-round Fiberglas, tapered to a point at the ends to mate with the special plastic forks that hold the elements firmly in place (see Photo B).

Elements are #14 AWG type THHN stranded wire, with ultraviolet-resistant insulation. The loops are spliced with end connectors and covered with heat-shrink tubing. Hitch pins hold the spreaders in place on the boom.

The T-Hunt System is a very light antenna (it weighs less than a pound) but the Fiberglas construction makes it very rugged. Yet, I suspect that in an encounter with a particularly vicious tree, an element might come off completely and remain snagged on a high limb! Fortunately, the T-Hunt System, like the other antennas in the Bandmaster line, carries a one-year full-replacement warranty.

You don't need tools to put the quad together. The AAE ads claim that it can be assembled in 10 minutes or less. I did it in nine-and-a-half minutes the first time; now I can do it in half this time. One minor annoyance is that the little plastic forks are not secured to the rod tips. They can get lost if you take the antenna apart frequently. AAE supplies a few extra forks and hitch pins, figuring that you'll lose some.

Head for the Hill

The first stop on my evaluation tour with the Q-144-2 was a local hilltop which gave an unobstructed view to several local and distant repeaters.

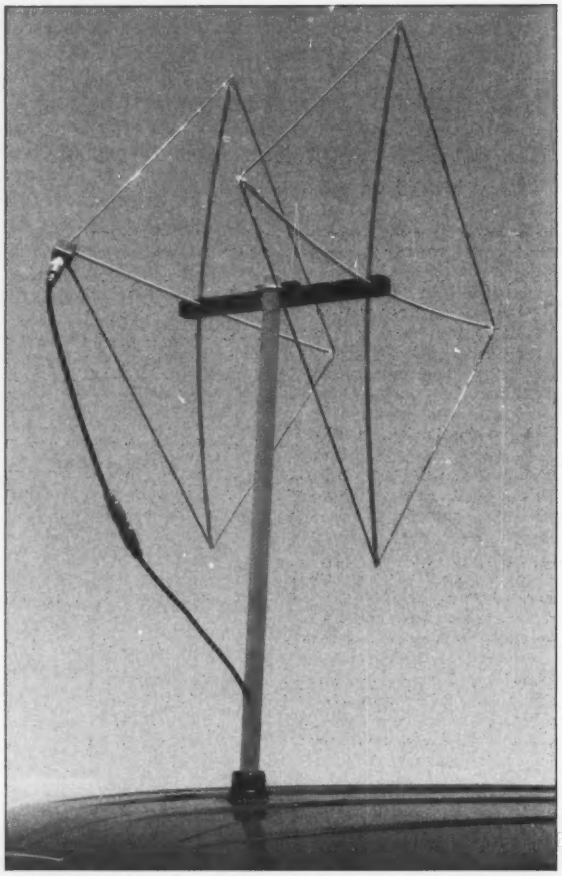

Photo A. The AAE Q-144-2 is installed on a PVC mount, ready for hunting. The quarter-wavelength matching line and coax routing give optimum transmitting SWR.

With no nearby reflecting objects, I got a good idea of the quality of the pattern and compared it to my regular 4-element hunting quad using a precision RF attenuator.

A 2-element quad is not a "super sharp" antenna. If you plotted it on polar paper, the azimuth pattern would be shaped more like a heart (cardioid) than a cigar or torpedo. The 3 dB beamwidth with vertical polarization turned out to be 101 degrees. In practical terms, this means that turning the antenna 50 degrees to the left or right of the peak makes the S-meter go down only about one-tenth scale.

Response with this antenna turned at right angles to the signal source (±90 degrees) was only 9 dB down, going to 21 dB down at ±135 degrees. By comparison, my home-brew 4-element quad has a 3 dB beamwidth of 62 dB, and is down 17 dB at −90 degrees. The 4-element quad also had 2 dB more gain than the Q-144-2, as expected.

The front-to-back ratio of the Q-144-2 is specified as greater than 24 dB. I found that the rear null was very sharp and much deeper. Depending on feedline routing, the null was 30 to 40 dB down. No doubt you could use the null to help get bearings in some situations.

Feedline routing makes little difference to the pattern but it greatly affects drive impedance. AAE recommends routing similar to Photo A, which gives feed point impedance of 100 ohms. The 13¼" length of RG-59 shown matches the quad to RG-58 feedlines. I achieved excellent transmitting SWR this way using a nonmetallic (PVC pipe) mast.

For receiving only, I found I could run RG-58 from the feed point to the top of the mast, then down the inside (no RG-59 matching line) with no degradation in RDF performance.

On many hunts, you must select horizontal or vertical polarization to match the polarization used by the hider. The fastest way to change polarization on the AAE VHF quads is to pop the driven element off the spreaders, rotate it 90 degrees, and pop it back on again.

I have needed to check polarization many times on some hunts, so I wish there were a faster way. For its foxhunting antennas, I recommend that AAE go to a circular boom with a slip joint at the mast junction so the entire boom can be rotated to quickly change polarization. This would give the added advantage of allowing "in-between" polarizations, such as 45 and 135 degrees, which help on some hunts and can't be achieved with the Q-144-2 as is.

The Acid Test

My first competitive test of the Q-144-2 was on the monthly "Pathfinder" hunt. (It gets its name from Pathfinder Road, which runs past the starting point in Diamond Bar, California.) This nighttime outing has boundaries that permit the hidden T to be over forty air miles away in some directions.

All of the ten other teams at the starting point were using quads or yagis with 3, 4, or 5 elements. WA6OPS and I had no trouble detecting the weak, vertically polarized hidden-T signal, but we were using an inline GaAsFET preamp. Several other teams could not hear the hiders (KB6MAH and KB6NYW) so they raised transmit power a bit.

The initial bearing was 57 degrees, straight toward Crestline in the San Bernardino mountains. Whenever this happens on a hunt from Los Angeles or Orange counties the hiders are alert to the likelihood of a "Baldy bounce,"

continued on p. 73

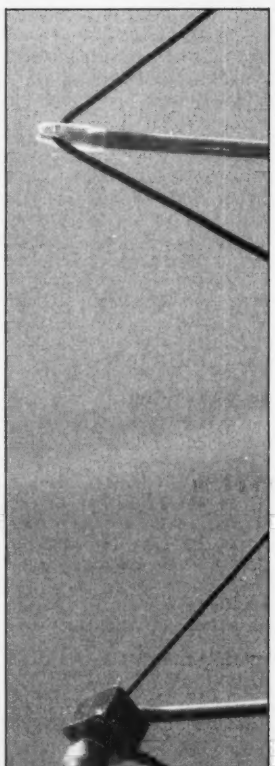

Photo B. This close-up of the Fiberglas rod tips shows one of the plastic forks that hold the elements in place, and the weatherproof coax connection for the driven element.

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Brick Oscillators and Crystal Multipliers

Some of you have sent in comments and questions about microwave brick oscillators (see the December 1989 issue) and microwave oscillator multiplier strings. You want to know which type of oscillator, the commercial brick or the crystal multiplier, is better. Now, I am a poor person to ask because I am about equally biased in both directions. I like to build; no, actually, I probably go out of my way to build just about anything that perks my interest. However, we don't have an infinite amount of time to build everything we'd like, so we must take shortcuts whenever possible.

The answer really depends on your needs and how involved you want to get in a project. Some of you may want to put off construction until you have all the components, while others may begin as soon as they locate a key component at a flea market. The deciding factor will probably depend on which component you find first. Availability, cost, ease of use, reliability, and stability all enter into the picture.

As to availability for amateur use, the crystal oscillator rates number one since it's home-constructed. The only difficulty is that if you want an exact injection frequency, you have to order the crystal. This is true whether you make your own multiplier chain or use a brick. If you can tolerate operation on some obscure or fortuitous frequency such as you'd get with a junk box crystal, so much the better. However, most operators want an even MHz frequency for local oscillator injection so an exact fractional value crystal is a must.

Location of a surplus brick oscillator makes the project a lot easier from the standpoint of construction and reliability. It's a matter of what you desire in a circuit and what you are willing to spend to accomplish that goal. If I can find a brick in the frequency range needed I will use it. For example, in a 10 GHz system (10,368 MHz) the L.O. is 10,223 MHz (2 meter IF), and the crystal required is 100.2254902 MHz. A multiplication factor of 102 is used with a brick oscillator. It's not too likely you'll find this exact frequency crystal in your junk box. An exception to this would be a more commonly available 108 MHz crystal; times 12 gives you 1296 MHz and times 96 puts you on 10368 MHz. This is great for a band edge marker but not useful when you figure in the IF frequency.

Whatever frequency you use, it should be temperature controlled.

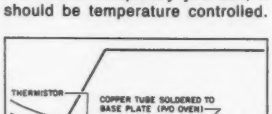

Figure 1. The thermistor inserted in copper or brass tube with heat-sink grease for best thermal contact.

That's the subject of this month's column: temperature control and the microwave circuit. I plan to build on this circuit and in the next few months go into the crystal oscillator multiplier system, winding up putting a 5.6 GHz system together.

Temperature Control Circuit

The crystal normally used in multiplier oscillator circuits is not temperature controlled, and as such it will change frequency with a change in temperature. The crystal can be set to an exact frequency, but it will wander as soon as a change in temperature affects it.

One problem is that when you use a surplus crystal, you can't be sure whether it's an oven type or not. To prevent temperature changes from affecting the crystal frequency, non-oven crystals are heated slightly above the ambient or outside temperature, while oven crystals are heated to a higher temperature.

The circuit used for temperature control is self-adjusting for any desired temperature. Select a bridge resistor equal to the thermistor equivalent resistance at the temperature needed. Oven type crystals normally are heated up to about 65 or 70 degrees Celsius (150 to 158 degrees Fahrenheit). Non-oven controlled crystals are heated to about 100 degrees Fahrenheit.

Calibration or verification of circuit operation is simple. You need two 10k thermistors. One is used in the control circuit and the other is used in the test circuit with an ohmmeter to verify that the circuit is working correctly. The 10k thermistor, similar to the electronic thermometer used in hospitals, is quite accurate, and it's readable to tenths of a degree with careful ohmmeter calibration. For our purpose a degree or two is not very important, but this simple setup will inform us about what is going on. All that is needed is a good thermal contact between the thermistor and the oscillator circuit, preferably the inner surface of a metal box housing the oscillator. See Figure 1 for thermistor positioning.

The temperature control circuit in these experiments was constructed from a single CA-3130 zero offset op amp. This useful device allows operation from just under ground potential to Vcc voltage swing. The temperature control circuit is a balanced bridge, one leg of which sets a reference DC voltage to pin 2. The other leg, comprising a fixed resistor and the thermistor, is the variable control arm of the circuit. The temperature is set by selecting a value for the reference resistor R1 to equal the thermistor resistance at the temperature desired. For example, at 50 degrees Celsius, the thermistor resistance should be 4.161 ohms. See the table for resistance vs. temperature calibrations.

Applying power to the circuit for the first time, the op amp turns on due to the reference voltage (pin 2) being higher than the thermistor control leg (pin 3). The thermistor at this time is at room temperature. The op amp and the TIP-120 transistor both turn on, and the heater coil begins to heat up due to current flowing through it. By the way, I wound my coil with Nichrome™ resistance wire, which requires far fewer turns than regular wire.

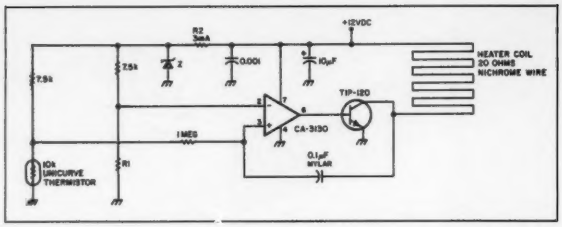

Figure 2. Temperature control circuit, positive 12 volts. Z = Zener diode (1.5 to 5 V). R2 set for 3 mA current through zener regulator.

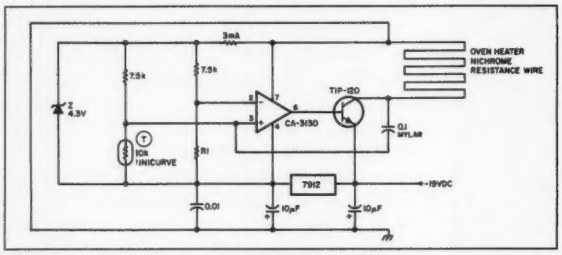

Figure 3. The temperature control circuit modified for negative 19 volt operation for compatibility with commercial brick type microwave oscillators.

As the coil heats up, the thermistor, which is in contact with the metal surface of the case, detects it. This heating causes the thermistor to decrease its internal resistance accordingly. This process continues until the thermistor resistance equals the R1 resistance, or the voltage on the bridge legs at both pins 2 and 3 are equal, which then turns off the op amp. As the circuit removes heat and the metal cools, the thermistor changes value. The op amp will turn on again, starting the cycle over.

Nichrome Wire

Kerry N6IZW designed this circuit. He has placed an unusual component in the feedback path, tying the output of the transistor to control pin 3 of the op amp. This capacitor and the 10 megohm resistor change the nature of the beast during initial turn-on, allowing the circuit to play "catch up." This helps bring the compartment up to temperature without large overshoot. When at temperature, the time constants of these components have little effect. See Figures 2 and 3.

The thermistor is available at Radio Shack, RS # 271-110, for $1.99 each. Nichrome wire is a little difficult to obtain, especially in small quantities. I purchased two rolls of the wire for this experiment and will make the wire available. Any wire can be used if the total resistance is the same. The wire that I have measures 2.34 and 7.479 ohms per foot. Nichrome wire can be ordered in various resistances per foot. It can have as little as 0.005 ohms per foot to 30 ohms per foot. The finer the wire, the higher the resistance.

Nichrome wire has another use. Shape a small piece of wire taunt between two nails, then run low voltage through it, heating it up to red hot. You can neatly cut clean slabs of styrofoam out of scrap packing material. The entire oscillator and heater circuit used as examples in the column were enclosed in such a container made with this "electric knife."

Next month I will get into the crystal oscillator portion of the temperature control circuit. The oscillator used in these experiments will operate from 90 to 108 MHz and can be used to control a brick type phase-locked oscillator, or serve as the beginning of a multiplier string. I have the circuit all prototyped out and working, and I should have a PC board designed by then that covers both the temperature controlled circuit and oscillator. By the way, the finished oscillator circuit is postage-stamp sized.

I used the oscillator I constructed as a reference feed for a 6 GHz brick oscillator. Normally these brick oscillators incorporate the oscillator internally, but lately surplus brick types require an external oscillator. At first I thought this was a a bad deal. However, after close inspection I found them to be in brand new condition and very high performers. I am in the process of obtaining a quantity of the bricks and will make them available to those interested in them.

The Gunn Warmer

Recently I ran into the Gunn heater, a Gunn temperature control circuit made by Alan Rutz, SHF Microwave Supply, 7102 W. 500, S. La Porte IN 46350. Alan deals in Gunn oscillators and is making this kit to improve frequency stability. Alan maintains 120 degrees inside his Gunn enclosure even when the outside temperature is

Continued on page 77

Temperature vs. Resistance

Degrees (C.)	(F.)	Resistance
0	32	27.28k
10	50	17.96k
20	77	12.09k
30	95	8.313k
40	104	5.828k
50	122	4.161k
60	140	3.021k
70	158	2.229k
80	176	1.669k
90	194	1.266k
100	212	0.9735k

Resistance values for several temperature control points of reference. (Radio Shack thermistor)

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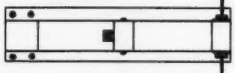

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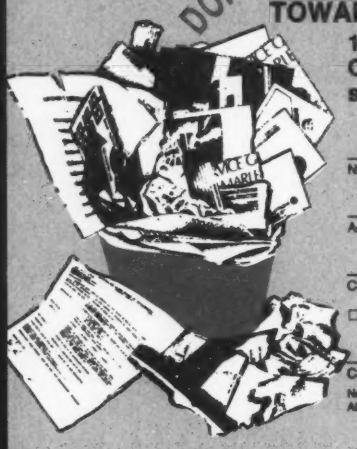

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HOMING IN *continued from p. 68*

where the hiders are in some spot in western Riverside or San Bernardino County, shielded from the start point by the Santa Ana mountains. The signal reflects back to the starting point off the face of Mount Baldy or some other mountain in the San Gabriel or San Bernardino ranges.

If the hider is pulling off a Baldy bounce, following the initial bearing northeast toward the foothills is the worst thing to do because the best Baldy bounce hiding spots on the Pathfinder hunt are at least 25 miles to the southeast. We carefully checked toward the southeast for any direct signal leakage, but heard nothing.

As we left the start, we decided to play it safe by going east on a freeway through the Chino Hills. Then we could aim to the north or south to see if the initial bearing was direct or a bounce. The Q-144-2 is much lighter than our usual quad. It was very easy to spin it by hand, even at the speed limit on the freeway.

After driving about 20 miles through Pomona, Chino, and Ontario, and carefully looking both north and south, we concluded that the hiders really were near the northern mountains. The decision to go north instead of south at that point was agonizing, because the wide beamwidth of the two element quad left us unsure about the possibility of missing a weak signal source from the south in the presence of the strong northerly signal. Besides, signals from the north in that area had always been bounces in the past!

As luck would have it, Martin and Wayne really were hidden in the foothills at 2,200 feet elevation, very close to the northeast corner of the hunt boundaries. (Whew!) On the Pathfinder hunt, the lowest elapsed mileage wins. N6FBH won this one with about 34 miles.

Our mileage would have been very close to winning if we had not missed the correct freeway exit, forcing us to go an extra two miles into the mountain pass and then back again. (I suppose I could blame the quad's wide beamwidth for our missing the exit. Nah, nobody would buy that excuse.)

Most of the other teams figured out the no-Baldy-bounce ruse. But two went southeast on a hunch, figuring to out-fox the foxes. One team put 100 miles on the odometer before finding the T. The other group gave up after four hours of frustration.

The Bottom Line

The Q-144-2 is a great little T-hunt antenna, mechanically and electrically. It's rugged, easy-to-build, and it looks great. If you hunt mostly in the flatlands, and signals always have reasonable strength and one polarization, it may be all you will ever need.

But if you hunt in southern California or anywhere else where there are very weak signals, multipath or cunning signal bounces, you should get the AAE 4-element model (Q-144-4) instead. For a reasonable price (about $50), you get much narrower beamwidth and more gain, with the same fine mechanical design.

Of course, the 4-element version is heavier (less than 4 pounds) and longer (41 inches), so you will want to mount it in the center of the vehicle roof to avoid a ticket for excessive overhang.

If you hunt on 220 MHz or 440 MHz, AAE can supply quads for these bands, too. For more information on all the AAE antennas, write the company at 3164 Cahaba Heights Road, Birmingham AL 35243, or phone (205) 967-6122. 73

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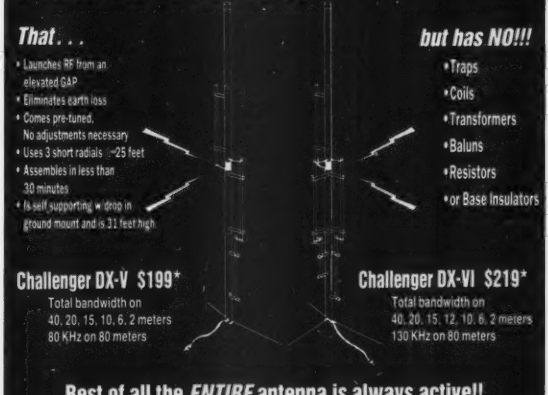
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73 INTERNATIONAL

edited by C.C.C.

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey, NH 03431

Notes from FN42

Time sure flies when you're having fun! This issue is my one-year anniversary writing the column. It sure doesn't seem like a year has gone by.

The job becomes easy when the 73 Hambassadors from around the world provide material that is timely and interesting. I just put it into some semblance of order and language. I certainly have enjoyed the past year and look forward to many more.

Well, I didn't make it to Ireland this year, but I did take a vacation to the states of Kansas and Colorado to visit with relatives and friends. I was very excited about the trip because I had not been to Gunnison, Colorado, and the family cabins along the Gunnison River for 18 years.

I was very glad that I took my 2 meter radio with me because I heard several of the local hams making plans for Field Day for the following weekend. Since I wanted to meet some of the locals, I volunteered my services as "gofer" (one who does whatever tasks need to be done). My time with Uncle Sam taught me never to volunteer, but I did anyway, and I'm certainly glad I did.

I met some of the most wonderful hams and families, and had a great time, too, both behind the mike of W0GYV (Whiskey Zero Gorgeous Young Virgin) and at the keyboard of the computer, logging and duping. The Field Day site was on a ridge at about 10,000 feet elevation with higher terrain to the north. The closest power line was probably five miles or more away, which made for a very quiet RF site. With two sections of tower to hold a triband beam, several sections of extension ladder to hang the 80/40 meter dipole, a 5-band vertical, and two generators (one for backup), the world was at our fingertips.

I'm not going to say how well we did, other than that all were happy with the results. During my two shifts of operation, I had the fortune to make many contacts, and took the time to chat a little, even though it may have been brief. Three stand out in my mind, two in New Hampshire and one in Kansas.

The first contact in New Hampshire was with the club station of the Great Bay Radio Association, the club I belonged to when I became a Novice, and the second was the club operating in the Mason, New Hampshire, area. One of the operators, NX1G, Craig Clark, and I usually talk daily on the Keene, New Hampshire, repeater when the weather is bad enough for him not to ride his motorcycle to work. It was sure nice to chat with him for a few minutes. The third contact was with a club station in Newton, Kansas. A former classmate and friend from my high school Class of 1958 had been the City Manager in Newton for a few years, but he had moved several years ago. I mentioned his name to the operator and received a very happy reply from the operator that he and his fellow operator both had known my friend very well. As we say, it's a small world.

Was it just luck that I happened to be the operator of the station when those contacts were made, or what? Was it luck that those contacts were even made? Was it luck that I just happened to get involved with a Field Day operation over 1,500 miles away from my home? Or is it a small world after all, and ham radio just makes it even smaller? I tend to think the latter.

I would like to thank Ken WA0TOJ, his lovely XYL, and all the other hams and families who made my 1990 summer vacation in Gunnison memorable. When you pass through, be sure to tune into the 147.12 GVARC repeater.

I plan to return to Gunnison next summer. I wonder if the dates will coincide with Field Day again. Time to start consulting my calendar.

For the rest of you hams around the world, get involved, have fun, and make the world a little smaller and a lot friendlier. Good things are happening and let's keep them happening.

—Arnie N1BAC

Roundup

Australia *From a letter by Ken Stevens VK5QW via Ted Melinosky K1BV.* In the June 1990 issue of *73*, we published the report that Ken VK5QW would be the new WIA Awards Manager. The report should have read that Ken was acting as a forward or collection point until a new manager was selected. The new WIA Awards Manager is Phil Hardstaff VK3JFE, PO Box 300, Caulfield South, Australia 3162. [*Our apologies, Ken, for any inconvenience this may have caused you.*]

Greece *From the Greek Mountaineers' Club.* The following describes a QSO in the 144 MHz band, using a large vertical limestone cliff as a reflecting surface.

The transmitting station, manned by Zafeiris Trompakas SV2AHT and Giannis Floros SV2AGY, was located near the top of Mount Olympus (Greece) at an altitude of approximately 2700 meters. They used an ICOM IC-02E with a 3-element beam and a ⅝-wave vertical. The receiving station was located in Thessaloniki, Greece, at sea level approximately 80 km from the other station. Nikos Kosmaras SV2AHJ manned the station, using a Yaesu FT-227 and a ⅝-wave vertical.

Line of sight was not possible, just noise when the beam was pointed directly at the receiving station. When the beam antenna was pointed at the Stefani (Headband) Cliff near the top of Mt. Olympus, a 4-unit signal on the receiver's meter was observed. The transmitting station was approximately 0.5 km away from the cliff. *[See Photo A. What we hams don't do for fun! —Arnie]* Greek Mountaineers' Club, 5, Aristotelous Square, Thessaloniki 54624, Greece.

Japan *From the JARL News.* Commencing October 14, 1990, the JARL will hold a national FOX-teering competition in Hyogo Prefecture under the sponsorship of the Japan Amateur Radio Industries Association.

This sport, which is noticeably gaining in popularity, saw 270 participants last year, among whom were Chinese, Koreans and one American. However, since 180 applicants have sent in their applications *[as of May 1990]*, the Executive Committee can well expect a number far surpassing this.

Paraguay *From the Radio Club Paraguayan Award Manager.* A complete listing of awards given by the club was sent for publication. The list is too lengthy to be printed here so you can find it on the *73* BBS in the "73 Intl SIG" called Paraguay Awards. The BBS information is located on the "Table of Contents" page.

Swaziland *From Newsletter No. 1 (May 13, 1990) from the Radio Society of Swaziland.* Following some gentle prompting from OM Peter ZS6ET *[73 Hambassador from South Africa]* late last year, OM Robin 3DA0AJ sent out a circular letter to all known amateur radio operators in Swaziland inquiring as to whether or not there was any support for a possible re-birth of a Swaziland radio society. Astonishingly, there was!

And so, on Sunday 11 March 1990, ten pioneers gathered at the home QTH of OM Willie 3DA0BD and established an Interim Committee of Management, tasked with the re-birth of the RSS. An Interim Committee of Management was elected: OM Willie 3DA0BD as Chairman; OM James 3DA0AW as Vice Chairman; OM Paul G4MSP/3DA0 as Treasurer; and OM Robin 3DA0AJ as Secretary. The Interim Committee has proposed an entrance fee of E5 and an annual subscription of E10. Application and fee

Photo A. The operating position on Mt. Olympus with the Stefani Cliff in the background.

payment can be sent to Robin 3DA0AJ, Box 23, Big Bend.

A 2 meter repeater on 145.6 is in the works *[if not already operating]* and there is a Tuesday Swazi Net on 3.675 MHz at 7 pm. The QSL Bureau, run by OM James 3DA0AW at PO Box 64, Manzini, is operating.

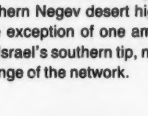
ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev MPO 85530
Israel
Packet: 4X1MK@4Z4SV

In this country of about 1,000 licensed radio amateurs, and maybe half that number operating an active station, 150 callsigns are registered users of the two packet radio BBSs here. Since it was first introduced in Israel only five years ago, this mode has grown in leaps and bounds.

A handful of dedicated packeteers, mainly in the Haifa area, had then started a BBS and digipeating, but as this computer-age mode caught on, the IARC took sponsorship of the packet network.

Today the two BBSs, 4Z4SV and 4X4HF, serve the north and center of the country respectively, one VHF-HF gateway station 4X1RU-1, and eight Net-Rom nodes, giving coverage from the northern border all the way down to the southern Negev desert highlands. With the exception of one amateur in Eilat, at Israel's southern tip, nobody is out of range of the network.



MOZAMBIQUE

Phil Gray KA7TWQ
c/o CARE, C.P. 4657
Maputo, Mozambique

Hello from Charlie Nine land! This is the first news letter from Mozambique and I hope they will continue on a fairly regular basis. For a little background, amateur radio existed in this former Portuguese Colony until Independence in 1974. But when the new government took over, armed resistance groups formed and fought a destructive campaign that continues to this day. Except for one case, no amateur activity has been permitted.

In October 1986, I was in Sudan when I learned my next assignment was to be Mozambique. I told my good friend and Sudanese ham, Dr. Sid ST2SA, about my hopes of setting up a station in Maputo. As one of only two or three amateurs in Sudan allowed to broadcast, and an ardent DXer, Sid knew more about the international scene than I did. He suspected I might be disappointed, as he hadn't heard of anyone broadcasting from C9 for years. When I got here in January 1987, it turned out he was only too right.

For the first few months I was so busy setting up the computer system for the Logistics Support Unit of the government agency in charge of emergency supplies that I had little time to think of anything else. A radio system existed, however, which tied our office in the capital with each of the 10 provinces, so by mid-1987 I had an official occasion to go to the Department of Telecommunications. There I met with Mr. Joao Jorge who was in charge of frequency allocation for the nation. With him was Mr. Flavio, his technical assistant. During the course of the meeting I found an opportunity to inquire about amateur radio. They explained how the internal hostilities that existed in nearly every province worked against any hope of radio transmissions not of official or military nature. Bad news but understandable. (Actually, Sudan was and remains in the same situation.) A few weeks later I was able to speak with Joao's boss, Rui Fernandes in his position of Director General. He was sympathetic and fully expected amateur service to begin again one day, but not soon.

In June of that year, the Dutch government informed us they had about $250,000 for a communications project if we were interested. Mozambique's telecommunication system is very shaky now but was nearly impossible at that time. With limited means of delivery, we needed to know when and where assistance was required so time and resources were not wasted. HF radio was the only way.

I wrote up a proposal to put 50 radios in the most accessible districts on the 10 provinces nationwide. I also included a section for ten packet radio stations—one for each provincial capital—to connect with our offices here in Maputo.

On my way out for home leave in February 1988, I stopped in Johannesburg to attend the Networking Conference presented by the Southern Africa AMSAT chapter. It was chaired by the president and attended by amateurs from South Africa and the region. There I met *73's* Hambassador to South Africa, Peter Strauss, as well as many other hams most anxious to assist Mozambique in any way necessary to get on the air once more. *[This is the end of Phil's first submission, and I'm certainly looking forward to more in the coming months and years.—Arnie]*

NEW ZEALAND

Des Chapman ZL2VR
459 Kennedy Road
Napier, New Zealand

Kia Ora from ZL-land. By the time you read this, we will have conferred at our Annual Convention and NZART Annual General Meeting. Only two remits for discussion were turned in prior to the meeting, one requesting that the AGM direct NZART Council to develop a policy on the desirability or otherwise of Morse code being a test requirement to qualify for operation on frequencies below 30 MHz, as is presently the case. Should this regulation be challenged? The other remit takes the opposite viewpoint—it urges our council to take steps to ensure that the present standards be maintained.

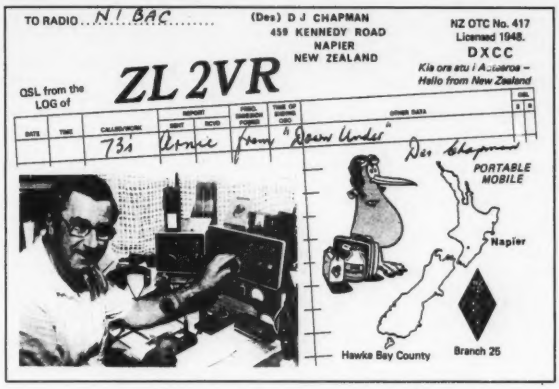


Photo B. 73 Hambassador Des Chapman ZL2VR and shack.

Of the constitutional remits, controversy is present regarding membership and nonmembership in NZART, some arguing that nonmembers derive the benefits of representation without paying their share of the costs. Others argue that the membership, which is about 50% of all licenced amateurs, are the voice for 100% of the licenced amateurs. 50% is a very high representation for a completely voluntary membership, considering that the international average of 1,799,000 licenced hams belonging to national societies is only 31%. What is very interesting statistically is that some of the largest countries have some of the lowest percentages of licenced hams belonging to their National Society. Why?

Just think of how much stronger our voice would be internationally if we had a greater percentage of licenced amateurs represented by our national amateur organisations. Membership is vital when our future is soon to be deliberated at an international conference (WARC) where, without proper representation, amateur radio might be 'stepped on' heavily by those with vested commercial interests in using the radio frequencies.

Enough of that...the Hastings Branch of NZART is sponsoring a 160m activity weekend, where the intention is to fire up the 160m band nationally and internationally to see what can be accomplished. The frequencies and dates are: 1840 and 1940 kHz ± on 20/21/22 October 1990, 0800–1600Z. No special rules, no QSLs unless requested; just fire up your rig and see how good conditions are on the band. Submit inquiries to ZL3DK, % NZART HQ, PO Box 40–525, UPPER HUTT, Wellington NZ.

And finally, congratulations to the Napier Branch on winning the NZART Field Day weekend operating contest. Napier had been close in past years, but had never managed to beat the "Big Gun" branches of the Aukland area. It's a bit like David and Goliath—Aukland has a population in excess of 500,000 and 8 NZART branches, while Napier has a population of 50,000 and one NZART branch. So you can see why Napier Branch is so pleased at last, winning this annual two-day weekend operation on 80 and 40 metres.

SPAIN

Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de G.C.)
Islas Canarias, Espana

My first visit to the Union of Spanish Amateur Radio Operators (Union de Radioaficianados de Espana, U.R.E.) clubhouse in Las Palmas was an eye-opener. First thing I heard was a theory class in progress with about 15 students. Nearby at the bar, several people were reading the latest issue of the U.R.E. magazine. In the next room, a packet station was shaping up. Lots going on.

The U.R.E. was able to get a special call for the Canary Islands Day (May 30) this year, an AM8–call. They broadcast from the same building that houses El Corte Ingles with the ED8SDR during the "Semana del Radioaficionado" (Amateur Radio Operator's Week) May 21–27. And each year during the International Fair (held April 23–29 this year) they set up a station at the fair and offer a diploma. They plan to operate during a commemoration in the month of November. Details will be reported as I receive them.

I'm still planning to go to Rumania in September so I am keeping up with the news with great interest. I am hoping to meet many hams there and bring you the latest news on the ham front.

Never Say Die

continued from page 4

tinued its growth, hurt our country? Are you even slightly critical of the League's monumentally poor PR effort? The League's score on this is near zero.

I am amused that the ham industry of the '60s was the major funder of its own demise. Now we're seeing the same pattern all over again as the ham industry of the '90s is enthusiastically and blindly paying for its destruction.

The Alternative

But what choice does the industry have? If they don't advertise in *QST*, how can they reach the ham market? *QST* has the largest circulation, so most advertisers are convinced they *have* to advertise there. If they have anything left in their ad budget they put it in *73* or *CQ*.

They could reach the active (buying) part of the market just through *73* and *CQ*, reaching the contest-oriented readers through one and those interested in new technologies and building through the other. You know, if the industry even cut their ads in half in *QST* and put them into *CQ* and *73*, you'd see some fast action at HQ to get started with the needed member services.

Of course it all comes down to money. If you do all your buying from *QST* advertisers, you're going to force them to continue to pay for their own suicide. If you make it clear to the industry that you are shopping in *73* and *CQ*, you'll bring about changes almost as fast as electing new directors. You might also help save *CQ*, which I'd hate to see go.

Some added advertising revenue won't hurt *73*, but all it'll do is help bring you a larger magazine. My music magazines are paying the freight quite well, so we aren't in any bind. *CD Review* was one of the fastest growing magazines in the country last year and should be again this year. It's fastest growing not only in circulation (up 40%), but also in advertising sales (up 34%).

There, you have something to talk about over the air other than the weather. Something to talk about at the next club meeting. Remember, about two-thirds of all hams don't read any ham magazines at all, so unless you tell them what's happening, they won't have a clue.

Now get busy getting your friends and fellow club members to oust the entrenched directors and start pushing the ham industry to stop shooting itself in the foot. And don't worry about ARRL President Larry Price, the new directors will make short work of him.

Ooops?

Well, while we hams can claim credit for inventing cellular radio, which is a result of the cellular repeater system set up in Chicago back around 1970, it's only logical that some service like this would have been developed even if we hadn't done the groundwork. It just makes sense that people would want to make phone calls from their cars.

Back when I was young, long distance phone calls were expensive. As a result I tended to avoid using the phone and used my typewriter instead. Cheaper. I still tend to avoid the phone, preferring my laptop computer, today's version of my old typewriter. Old habits don't die easily.

Phones in cars are normal now, even though they're far from inexpensive to use. I suspect this is because people in business today are so used to grabbing the phone, it normally being cheap to use, that the habit is as hard to break for them as mine is for me. Which is great for the cellular business.

The next step is obvious: personal phones. They're already trying 'em out in London, so they'll be along here soon. We'll be seeing cellular prices come down if the FCC ever permits competition. And that brings me to my favorite gloom and doom subject: frequencies.

I see in *EDN* magazine projections that today's $9 billion cellular business is expected to get up to around $150 billion within ten years. Think they'll do that without more frequencies? And who do you think is going to get the prime RF real estate and who'll be in the slums?

The FCC is run by Congress. And who runs Congress? You? Me? You know as well as I do who runs Congress...whoever has the money. We've seen how much clout firms who invest $10,000 in a senator or congressman get; imagine what kind of action the cellular radio industry might command if they set aside 2% of their revenues for five years to buy more frequencies. That's $15 billion they'd have to invest. Let's be cheap and only invest one third with the Senate. That's $5 billion split 100 ways, or about $50 million per senator.

Heck, that'd only leave about $20 million for each congressman. Still, that might be enough to counter several hundred tearful moneyless letters from hams.

Hey, there's an idea for a good business for hams to get into...making pocket-sized code oscillators so we can send Morse Code over our cellular phones to each other on our old ham bands.

Other Technologies

Things are going wireless. We're seeing wireless TV and audio distribution systems for homes. We're seeing wireless security systems. Computers are going wireless. Data links. Toys. There are community TV stations. HDTV is acoming. Local area radio information systems for traffic and shopping guidance. Wireless light switches and other remote controls for homes are on the way. The 1990s are going to bring us the biggest changes in electronics yet, and a bunch of it is going to need spectrum space.

We'll be able to do a lot with satellites...like keeping track of cars and trucks. We may even be able to use satellite links for communications, but I suspect that fiber optics will eventually provide lower cost service and phase out most of this. This'll give us more spectrum space for direct satellite digital TV and radio broadcasting. Ooops, there go our microwave bands! Oh well, we're not using 'em anyway, right? Big deal.

The Bright Side

Those of us who keep up with technology will be in a great position to take advantage of these new technologies as they come along. The equipment will be designed in Japan and built in Asia somewhere, but they're going to need us to sell, install and service it. They'll need technicians to operate the communications centers which will make all this stuff work.

Spread Spectrum

Though we hams are allowed to experiment with spread spectrum communications, we're still mostly hung up on CW and other old communications modes. I'm surprised I haven't seen any petitions sent to the FCC requesting the return of spark.

Spread spectrum, which was developed to help keep military communications secure, is now beginning to creep into everyday products. It's an easy way to have several wireless controlled things going on without them interfering with each other.

For instance, by building an encoder chip into a wireless light switch and a decoder chip into the light socket, you'll be able to control your light from almost anywhere, with any number of switches. The same technology will allow your garage door opener to open your door and not your neighbor's. It'll let you send several digital stereo signals around your house to speakers without interference. It'll give you privacy with your cordless phone. We should soon be seeing computer networking systems using spread spectrum. Most new spread spectrum products are using our shared 902 MHz band, by the way.

We'll be seeing wireless computer nodes and wireless networks, complete with repeaters to extend their range.

Medical applications will be along soon too...such as a monitoring unit for cardiac patients. If the monitor etects anything amiss it will dial the local phone and send the information automatically to the local hospital to bring help fast. This could help save hundreds of thousands of lives.

Musicians are already using digital spread spectrum so they don't have to trail wires around the stage. With these there is none of the occasional dropout experienced with the older FM analog technology.

They're already using the technology to send prices to grocery shelves for automated pricing. By next year we'll have digital audio quality, completely private wireless phones.

Interested?

If we publish some articles on spread spectrum in *73*, will you bother to read 'em? Or should we be looking for stuff on narrow-band spark rigs? Are you ready to put together some kits or do we have to get commercial companies to put it all together for you so you can buy it and plug it in? Please advise.

Is It Really Hopeless?

Of course not. The gloom and doom scenerio will only kick in if the ARRL members remain as paralyzed as they have for the last few years. If they refuse to re-elect any directors for two years we'll have a whole new deal. We might even get the League to lurch into action and save our bacon.

If you pull the old lemming act, blindly re-electing the same old do-littles, we're probably goners. I think even my bitterest enemies, like Bill Orr W6SAI, who is still angry with me for opposing Incentive Licensing 25 years ago, will agree on this one. 73

QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year Subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

ABOVE AND BEYOND

continued from p. 70

"ZERO." Stability of about 10 kHz over 24 hours was reported in one experiment. The kit Alan offers comes set for about 120 degrees F, but it can be changed or remotely set. Instead of using a coil of wire as I did, Alan used a power TO-220 mounted resistor in his circuit. The unit bolts to most sources using the existing UG-39 flange horn mounting screw. Complete kit with all parts, PC board and instructions is $20 postpaid from Alan Rutz.

Mailbox Comments

Richard K9RLS says he enjoys our articles, as they inspire newcomers to microwave to give it a try. He states that many articles are either too complex, expensive, or pie in the sky, but that mine was great! That kind of letter will make your hat size increase every time. I try to keep everything basic and easy to replicate.

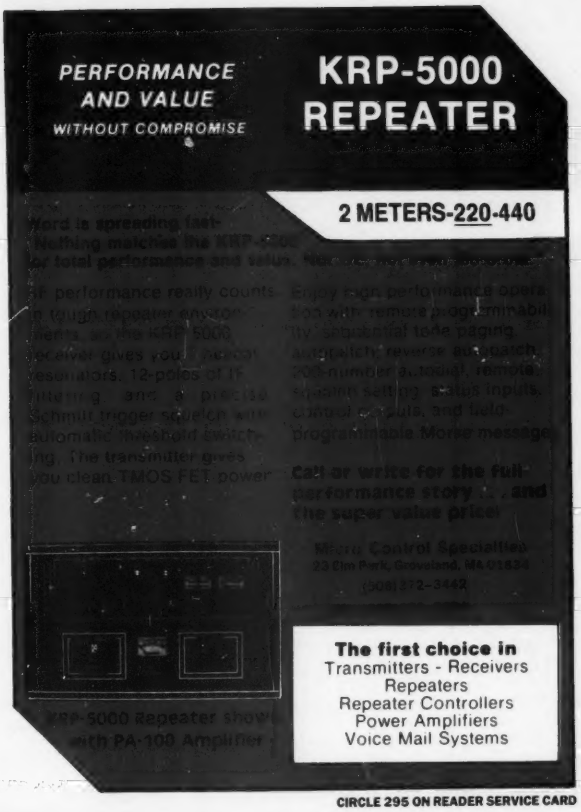
I hope that I am providing you with a varied and useful source of information and will continue to do so till I run dry. I can't take credit for all the items that appear in this column (I am not that clever). I must rely on many others for their contributions and ideas which are used in a pass-the-information-along spirit. Without contributions from readers and members of our microwave group, this column would run flat. So keep the letters and questions flowing. I also want to publish any interesting photos you would like to share covering microwave or VHF topics.

I have the resources to make PC boards and a small darkroom to help with artwork and photo copying. It's kind of like being in twelve places at once, or wearing many different hats. It's cost effective to do the work yourself. Needless to say, this school of hard knocks was worth it. Vernon N4UL is planning to establish a full duplex repeater link using 10 GHz as the backbone. He is going to try wideband FM and see if it will do the job. He knows it will work, but would like more information on systems currently in use with AFC control for drift-free operation.

Scott VE7FYC of Vancouver, Canada, has a 10 GHz station in the construction mill. He states that the Northwest ARRL convention is not being held this year and he might come to the San Diego Convention. That's quite a trip. If you make it, Scott, I have to give you a tour of the surplus connections here in San Diego.

David WA4SNY in Lynchburg, Virginia, is also putting a 10 GHz wideband system together. He says, "I haven't played around with amateur microwave since my 2K25 system in the late '60s." Well, David, I hope you have as much fun with the newer equipment as you did with the tube systems. Newcomers should be aware that the tube systems of the sixties required klystron power supplies, which are like hauling two car batteries around. The newer solid state microwave equipment is so light in contrast that going mountain topping now is no longer a chore.

As always I will be glad to answer any questions on microwave or related subjects. Please include an SASE for a prompt reply. Chuck WB6IGP.



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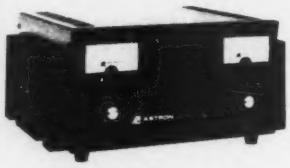

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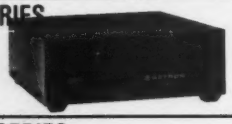
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

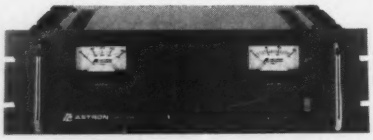


MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅞ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES



MODEL RM-35M

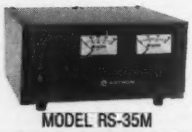
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• 19" RACK MOUNT POWER SUPPLIES				
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6½ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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Return of ShuttleVision

Apparently the hydrogen leak has been fixed on the *Columbia* shuttle. If all goes well we may see liftoff of mission STS-35 sometime between the last of August or mid-September. This should coincide nicely with the beginning of school. Here's your chance to bring the shuttle video into the classroom. Live television from the shuttle, NASA Mission Control activities, and continuous coverage of the liftoff and landing are relayed via the NASA select channel on the SATCOM F-2 satellite, transponder 13.

Thanks to an agreement with NASA a few years ago, hams can receive these transmissions on a ty and never know it. You can try tuning around randomly with your TV receiver, but if you get lucky and actually receive a picture, you may not know where to contact the senders on voice.

In this column I plan to periodically list ATV groups and their operating frequencies for various parts of the country and even the world. This travel guide to ATV should help you make some very enjoyable contacts while roaming about. If your group would like to be included in this series, please send me your information at the above address. Please include your 2 meter (or whatever) talk frequency, list any activity nights or ATV club meetings, ATV frequencies (70cm, 33cm, 23cm, 13cm, 10 GHz, laser beam, etc.), polarization and any ATV repeater information. Also please send in photographs of members of your group and any activities using ATV. I promise to make you internationally famous!

SPACE SHUTTLE - NASA SELECT VIDEO REPEATERS - July 15, 1990 Compiled by Tom O'Hara, W6ORG

SITE LOCATION	CITY - AREA	ATV /ANT.	2 METER	RPT CALL	CONTACT	ADDRESS		
ARIZONA								
19th & Unionhills	Phoenix	427.25 V	145.170S	WV7K	Norm Sharpe	1817 W. Wescott Dr	Phoenix	85027
CALIFORNIA								
Bakersfield res.	Bakersfield	427.25 V	146.430s	H6TFQ	Terry Godley	2701 Fordhyam	Bakersfield	93306
Mt. Wilson	Los Angeles	1241.25 V	146.430s	KB6MIN	Tom O'Hara	2522 Paxson Lane	Arcadia	91007
Mt. Diablo	San Francisco	427.25 V	147.090+	W6NKF	Don Smith	1808 Rolling Hill Way	Martinez	94553
La Cumbre Peak	Santa Barbara	1277.25 V	146.430s	WB9KMO	Rod Fritz	622 W. Mission St.	Santa Barbara	93101
East Sacramento	Sacramento	923.25 V	-	N6HOS	Jim Buckman	7454 Henrietta Dr.	Sacramento	95822
Sulphur Mtn.	Ventura	1253.25 V	146.430s	WA6UCL	Alan Pettabone	2752 Machado St.	Simi Valley	93065
FLORIDA								
Beach & Orange Av	Daytona Beach	421.25 V	144.340s	K4BV	Victor Leisner	9 Venetian Circle	Daytona Bch	32118
Kennedy SFC So.	Merritt Island	434.0 V	146.940-	K4GCC	John Andersen	POB 672	Merritt Island	32952
IDAHO								
Deerpoint	Boise	426.25 H	145.250-	N7MOE	Brian Rayl	3750 E. Overland	Meridian	83642
ILLINOIS								
-	Hillsboro	439.25 H	144.430s	K9GM	Scott Millick	907 Big Four Av	Hillsboro	62049
63rd & Main	Downers Grove	426.25 V	-	K9ZNE	Len Bateman	6116 lane Place	Downers Grove	60516
MARYLAND								
Naval Academy	Annapolis	923.25 V	144.930s	WB4APR	Bob Bruninga	89 Southgate Av	Annapolis	21401
MICHIGAN								
East Dearborn	Dearborn	1277.25 V	224.46-	K8OCL	John Champa	7800 Hartwell St.	Dearborn	48126-1122
MISSOURI								
S.E. Joplin	Joplin	421.25 V	146.46s	WØTQR	Ron Colt	RT 2 box 615	Joplin	64804
OKLAHOMA								
Sand Springs	Tulsa	421.25 H	145.58s	WA5LVT	Mike Reynolds	POB 2650	Tulsa	74101
NEBRASKA								
CHS Tower	Omaha	421.25 V	147.000-	WBØNEU	John Gebuhr	2340 N. 64th St.	Omaha	68104
NEVADA								
Mt. Potosi	Las Vegas	1253.25 V	-	KB7BY	Jeff Gomes	3208 Crystal Pool Dr.	Las Vegas	89117
OHIO								
Berwick School	Columbus	439.25 V H	147.450s	WBØMR	Bill Parker	2736 Floribunda	Columbus	43209
OREGON								
Council Crest	Portland	1277.25 V	146.430s	WA7DRO	Dennis Belles	15800 SE Francis AV	Milwaukie	97222

SPACE SHUTTLE - NASA SELECT VIDEO REPEATERS - July 15, 1990 Compiled by Tom O'Hara, W6ORG

SITE LOCATION	CITY - AREA	ATV /ANT.	2 METER	RPT CALL	CONTACT	ADDRESS		
TEXAS								
Downtown	Beaumont	421.25 H	145.470-	KE5O	Steve Gomez	985 Garland	Beaumont	77705
-	Kilgore	426.25 V	145.450s	K5KFC	Dave Baxter	16105 Buckboard	Tyler	75703
Cable TV Tower	Tyler	421.25 V	145.450s	W5KPZ	Dave Baxter	16105 Buckboard	Tyler	75703
Co. Court Bldg.	Richmond	1253.25 V	147.300+	N5ECP	Jeffery Salmons	309 So. 4th Suite 625	Richmond	77469
WISCONSIN								
-	Wausau	421.25 V	144.340s	AD9W	Dean Andrzejeski	1204 11th St	Mosenee	54455

ATV retransmission sites for NASA Select shuttle video (compiled by Tom O'Hara W6ORG).

"As more groups adopt a standard calling frequency, we'll see more interaction between nearby groups that may currently be unaware of each other."

home satellite system and legally retransmit both the audio and video. In the May '90 "ATV" column in *73*, I mentioned that Tom O'Hara W6ORG was compiling a list of those groups or repeaters planning to retransmit shuttle video from the NASA select satellite feed. This list is being distributed as part of a SAREX information package so that interested schools can tune in. It's not too late to be added to this list (keep in mind that the next SAREX mission, STS-37, is still tentatively scheduled for November).

See the table for a current list compiled as of July 15 (included are a local 2 meter coordination frequency and a contact address). Send new entries or updates to Tom O'Hara W6ORG, 2522 Paxson Ln., Arcadia CA 91007.

ATV Travel Tips

Whenever I go on a trip to a new part of the country I try to find out if there is any ATV activity in the region. Whether you're just traveling through, camping out or staying in a motel, you can have a whale of a lot of fun making new contacts on ATV. They're out there; you just have to find them! ATVers are not easy to find; unless you know where they meet on 2 meters (or 220 MHz, etc.), you may be in a real hotbed of activi-

Talk Frequencies

Two frequencies, 144.34 and 146.43 MHz, have been finding wide acceptance as national ATV coordination frequencies. As more groups adopt a standard calling frequency, we'll see more interaction between nearby groups that may currently be unaware of each other. It'll also help the traveling ATVer find the locals.

These frequencies have been chosen in order to minimize the effects of the third harmonic to your ATV receiver when you're talking on 2 meters (144.34 MHz minimizes interference to 439.25 MHz receive, and 146.43 is useful in areas with 434 MHz receive). The 146.43 MHz frequency is most popular in Southern California, Oregon and Washington State. 144.34 MHz seems to be most popular in the following regions of the Midwest and East Coast: Iowa, Missouri, parts of Michigan, parts of Florida, Wisconsin, Illinois, Indiana, Ohio (147.45 MHz also used); Erie, Pennsylvania; Buffalo, New York; and the Springfield, Massachusetts/Hartford, Connecticut, area.

A number of groups may be in local working range of each other, but they may not know about each other due to different talk frequencies. Hopefully we can ferret out all the many possibilities and get these groups talking to (and watching) each other!

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Maryann (WB6YSS)

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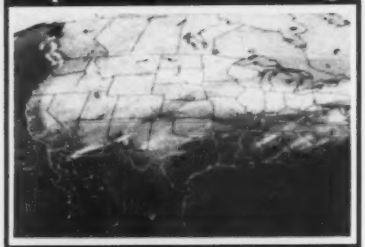

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EB63 140W $ 88.65
EB27A 300W $139.20
EB104 600W $442.15
AR305 300W $383.52

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ATV3 420–454 (GaAS–FET).....$ 49.95 Kit
ATV4 902–928 (GaAS–FET).....$ 59.95 Kit

AUDIO SQUELCH CONTROL for ATV
SQL.....$ 39.95 Kit

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75 Watt Model 875A.....$119.95 Kit
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KEB07—PK (kit).....$180.95
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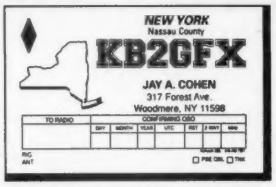

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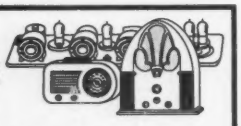

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A Braille reference manual entitled *DX Around the World* is now available for the blind U.S. ham. The book is edited by Larry Cox, WA6AIL and made available through the San Diego Braille Transcribers Guild Inc., 1807 Upas Street, San Diego, CA 92103.

The 55-page manual contains the 324 countries on the ARRL current countries list, alphabetically listed by both prefix and country; also the beam headings in *True Degrees* and mileage in statute miles from the geographical centers of the West Coast, Midwest, and East Coast of the United States. Then the approximate time plus or minus Universal Coordinated Time and the country's zone are listed. There is also a brief discussion of the Solar Index and Sunspot Cycle and how they affect the DXer.

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DXDA '90
The Dynasty Grows . . .

73 Magazine welcomes the new members to the growing DX Dynasty Award cadre! Special thanks to DXDA chairman Bob Reed WB2DIN for processing the results. Congratulations to all for a job well done.

BASIC AWARD—100 COUNTRIES WORKED

1. W1RFW
2. WB2DIN
3. KT1A
4. W3FDU
5. KA9JOL
6. WB1BVQ
7. NW7O
8. AK4H
9. W3HCW
10. KZ2W
11. K9FD
12. WD5N
13. KA9TNZ
14. K9GBN
15. N5GAP
16. WB3FMA
17. NN6E
18. AL7HG
19. N6CGB
20. KI6AN
21. K9JPI
22. N4WF
23. K6PKO
24. KW7J
25. VE6JO
26. WA4IUV
27. W4ZFE
28. N4KMY
29. W0HBH
30. K8KJN
31. KG1V
32. K1KOB
33. KY3F
34. PY2JY
35. YB5BEE
36. YB5BEH
37. WB9SBO
38. N0AFW
39. KA9MOM
40. N3II
41. W6DPD
42. KE8GG
43. VE6VK
44. KD9RD
45. W4WJJ
46. K0HSC
47. KI6GI
48. IK1APP
49. KJ4RR
50. K8MDU
51. N1EIU
52. K1DRN
53. WD8REC
54. ZL2BLC
55. VE3EFX
56. W9MCJ
57. N6IV
58. KN8D
59. KC5YQ
60. WB6ITM
61. KA2AOT
62. K4LHH
63. VE2QO
64. KE5AT
65. W9SU
66. W3OOU
67. NR2E
68. KF5PE
69. N3FBN
70. KB4SJD
71. N3EZX
72. IK8GCS
73. WB4I
74. NG1S
75. WB7UUE
76. HK4EB
77. K0BFR
78. N7GMT
79. AA4VN
80. KA1LMR
81. N8AXA
82. NM2I
83. KD9YB
84. HC2CG
85. VE1BXI
86. YC2OK
87. N4GNL
88. GM3UBF
89. 5Z4BP
90. I0AOF
91. VE1BN
92. KA2NRR
93. 5Z4DU
94. KB8ZM
95. HK4CCW
96. W2JQ
97. HC2AGT
98. WD5N/M
99. VE1BHR
100. VE1AGZ
101. K5AOB
102. KW2D
103. PY3ARZ
104. WB4ETD
105. N2FPB
106. KD3CQ
107. K4NNK
108. VU2DNR
109. AA5BE
110. PY3OG
111. VE4ACF
112. VE4SI
113. PJ2KI
114. WB4CKY
115. W6EQB
116. KK4IY
117. IK1IYU
118. N6GCN
119. KB1AF
120. KB8BHE
121. KE2CG
122. VS6CT
123. G3IZQ/W
124. WB6FNI
125. KA0IAR
126. K9SM
127. W6BCQ
128. KA5MSL
129. WB4FLB
130. N7GLT
131. WA0X
132. KF4GW
133. N4QGH
134. VE1CBK
135. 7J1AAL
136. K6ICS
137. NZ7W
138. WB0N
139. WC7F
140. F6IFE
141. KL7N
142. KE8LM
143. WA6YOO
144. VE2MFD
145. N3APQ
146. HK1DBO
147. NM3V
148. IK6GFY
149. WB6UAN/M
150. NK6Z
151. KB6IUA
152. W9OKH
153. WB5FXT
154. NB3E
155. N2ESP
156. YU2EJU
157. OZ1DXX
158. IK5IIU
159. KA1ION
160. KD3AI
161. OK1AEH
162. W9LCR
163. 8P6SH
164. KA6SPQ
165. ZF2KH
166. W6MVV
167. JA8CAQ
168. KI6WF
169. K2MRB
170. AA6GM
171. JA0SU
172. NU8Z
173. G0GRK
174. YB8VM
175. DV1BRM
176. W0TU
177. N7CNH
178. PY3IO
179. YB0ZCA
180. YB0AF
181. VE3PQB
182. W2SV
183. N1ADE
184. WP4AFA
185. KS7V
186. W2OFB
187. G4ASL
188. N5JUW
189. KA8WAS
190. 5N0WRE
191. AA4IP
192. JR5KDR
193. KD2WQ
194. KA3NIL
195. WA8YWK
196. VE1ACK
197. HP2XVB
198. WB5KYK
199. N5JUJ
200. N4OBJ
201. 9Q5NW
202. KW2D
203. VE1HA
204. HP8BSZ
205. IK8JJQ
206. YC3DKN
207. I3VKW
208. K2EWA
209. KD3CR
210. N9GDG
211. KF8K
212. FD1BEG
213. DU1DZA
214. N8IMZ
215. KK4YA
216. LU1JDL
217. KA8YYZ
218. KA4TMJ
219. WA9DDC
220. YI1CIS
221. YC3FNL
222. G0FWG
223. KV4B
224. N5IET
225. WA9WIG
226. N3CDA
227. KE6KT
228. IK7DBB
229. JY5EC
230. N1ETT
231. PY2DBU
232. I8IYW
233. N0ISL
234. KC4BEB
235. WA7QQI
236. KA1RJG
237. OZ9BX
238. KB4HBH
239. KA3RWP
240. NJ1T
241. W4DCG
242. YC0RX
243. VE7OJ
244. AA4W
245. N9GMM
246. KB4HBH
247. KM4HF
248. CE1YI
249. KA1FVY
250. N2GVB
251. N2DAO
252. WF8E
253. YB0HZL
254. N5MBD
255. N4SNS
256. KA3TGY
257. JN3XLY
258. N4DUV
259. KA9MRU
260. KA4OTB
261. N4JED
262. AB4KA
263. WA7OET
264. KA3RVH
265. CE7ZK
266. NI9J
267. WB9PTN
268. KB8DAE
269. W0CL
270. WB7VUB
271. JF6TUU
272. ZY3IO
273. KB4VIR
274. OE6CLD
275. N7JJQ/DU3
276. KK4FB
277. DU1AUJ
278. K2EWB
279. NI5D
280. N2JXC
281. N0IWT
282. WB3BDH
283. K1CVF
284. KA3CXG
285. KA1SPO
286. WA4NWT
287. KJ4OI
288. KA3UNQ
289. WB2VMV
290. KD4MM
291. OE3DHS
292. KD9HT
293. DL8OBC
294. G3KVA
295. WA4NEL
296. KA4VZO
297. N0IDT
298. KA1FUE
299. KD7EO
300. JH8MWW
301. KB8ICD
302. JA1CKE
303. N3GEE

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6GCB
4. K9FD
5. N0AFW
6. N3II
7. WB1BVQ
8. KA2AOT
9. KI6GI
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/W1
19. WB6FNI
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IIU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVV
30. JA8CAQ
31. KI6WF
32. JA0SU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. WP4AFA
39. 5N0WRE
40. KD2WQ
41. VE1ACK
42. N5JUJ
43. 9Q5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. G0FWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJ1T
53. CE1YI
54. YB0HZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. N0IDT

200 COUNTRIES ENDORSEMENT

1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. N0AFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6GCB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5N0WRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCQ
20. CE7ZK
21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU

Official DX Dynasty Countries List: 9/1/90

ABU AIL	A15
AFGHANISTAN	YA
AGALEGA ISLAND	3B6
ALAND ISLANDS	OH0
ALASKA	KL7
ALBANIA	ZA
ALDABRA ISLAND	VQ9
ALGERIA	7X
AMERICAN SAMOA	KS6
AMSTERDAM ISLAND	FT/Z
ANDAMAN ISLAND	VU4
ANDORRA	C3
ANGOLA	D2
ANGUILLA	VP2E
ANTARCTICA	KC4
ANTIGUA	V2
ANTIPODES ISLAND	ZL
ARAN ISLAND	EJ0
ARGENTINA	LU
ARMENIA	UG
ARUBA	PJ4
ASCENSION ISLAND	ZD6
AUCKLAND ISLAND	ZL9
AUSTRALIA	VK
AUSTRIA	OE
AVES ISLAND	YV0
AZERBAIJAN	UD
AZORES ISLANDS	CU2
BAHAMA ISLANDS	C6
BAHRAIN	A9
BAKER ISLAND	KH1
BALEARIC ISLANDS	EA6
BANGLADESH	S2
BARBADOS	8P
BEAR ISLAND	JW
BELGUIM	ON
BELIZE	V3
BENIN	TY
BERMUDA	VP9
BHUTAN	A5
BOLIVIA	CP
BONAIRE	PJ9
BONIN	JD1
BOPHUTHATSWANA	H5
BOTSWANA	A2
BOUNTY ISLAND	ZL
BOVET ISLAND	3Y
BRAZIL	PP–PY
BRITISH VIRGIN ISLANDS	VP2V
BRUNEI	V8
BULGARIA	LZ
BURKINA FASO	XT
BURMA	XZLL
BURUNDI	9U
BYELORUSSIA	UC
CAMEROON	TJ
CAMPBELL ISLAND	ZL9
CANADA	VE
CANARY ISLANDS	EA8
CAPE VERDE ISLANDS	D4
CAPRI ISLAND	IC
CAYMAN ISLANDS	ZF
CEDROS ISLAND	XF1
CELEBES	YB
CENTRAL AFRICAN REPUBLIC	TL
CENTRAL KIRIBATI	T3
CEUTA AND MELILLA	EA9
COUNCIL OF EUROPE	TP2
CROZET ISLAND	FT.W
CURACAO	PJ
CYPRUS	5B4
CZECHOSLOVAKIA	OK
DENMARK	OZ
DESECHEO ISLAND	KP5
DESROCHES	VQ9
DIEGO GARCIA	VQ9
DJIBOUTI	J2
DODECANESE ISLANDS	SV5
DOMINICA	J7
DOMINICAN REPUBLIC	HI
EAST CAROLINE ISLANDS	KC6
EAST GERMANY	Y2–Y4
EAST KIRIBATI	T32
EASTER ISLAND	CE0
ECUADOR	HC
EGYPT	SU
EL SALVADOR	YS
ENGLAND	G
EQUATORIAL GUINEA	3C
ESTONIA	UR
ETHIOPIA	ET
EUROPA ISLAND	FR/E
FALKLAND ISLANDS	VP8
FAROE ISLANDS	OY
FARQUHAR	VQ9
FERNANDO DE NORONHA	PY0F
FIJI ISLANDS	3D2
FINLAND	OH
FRANCE	F
FRANZ-JOSEF LAND	UA1
FRENCH GUIANA	FY
FUTUNA ISLAND	FW
GABON	TR
GALAPAGOS ISLAND	HC8
GAMBIA	C5
GEORGIA	UF
GHANA	9G
GIBRALTAR	ZB2
GLORIOSO ISLAND	FR/G
GOUGH ISLAND	ZD9
GOZO ISLAND	9H4
GRAHAM LAND	VP8
GREECE	SV
GREENLAND	OX
GRENADA	J3
GUADELOUPE	FG
GUAM	KH2
GUANTANAMO BAY	KG4
GUATEMALA	TG
GUERNSEY	GU
GUINEA	3X
GUINEA-BISSAU	J5
GUYANA	8R1
HAITI	HH
HAWAII	KH6
HEARD ISLAND	VK0
HONDURAS	HR
HONG KONG	VS6
HOWLAND ISLAND	KH1
HUNGARY	HA
ICELAND	TF
IFNI	EA9
INDIA	NU
INDONESIA	YB
IRAN	EP
IRAQ	YI
IRELAND	EI
ISCHIA	IC
ISLE OF MAN	GD
ISRAEL	4X
ITALY	I
IVORY COAST	TU
JABAL ATTAIR JAMAICA	6Y
JAN MAYEN ISLAND	JX
JAPAN	JA
JARVIS ISLAND	KH5
JAVA	YB
JERSEY	GJ
JOHNSTON ISLAND	KH3
JORDAN	JY
JUAN DE NOVA ISLAND	FR/J
JUAN FERNANDEZ ISLAND	CE0
KALININGRAD	UA2
KAMARAN ISLAND	VS9
KAMPUCHEA	XU
KAZAKH	UL
KENYA	5Z
KERGUELEN ISLAND	FT.W
KERMADEC ISLAND	ZL8
KIRGHIZ	UM
KOREA	HL
KURE ISLAND	KH7
KUWAIT	9K
KWAJALEIN	KX6
LABRADOR	VO2
LACCADIVE ISLANDS	VU7
LAMPEDUSA ISLAND	IG
LAOS	XW
LATVIA	UQ
LEBANON	OD
LESOTHO	7P
LESSER ANTILLES	PJ
LEVANZO ISLAND	IF9
IBERIA	EL
LIBYA	5A
LIECHTENSTEIN	HB0
LINE ISLANDS	T32
LITHUANIA	UP
LORD HOWE ISLAND	VK2
LUXEMBOURG	LX
MACAO	XX
MACQUARIE ISLAND	VK0
MADAGASCAR	5R
MADDALENA ISLAND	IM
MADERA ISLAND	CT3
MALAWI	7Q
MALAYSIA	9M2
MALDIVE ISLANDS	8Q
MALI	TZ
MALYJ-VYSTOSKIJ (M-V) ISLAND	4J
MALPELO	HK0
MALTA	9H
MANIHIKI	ZK1
MARCUS ISLAND	JD
MARIANA ISLAND	KH2
MARION ISLAND	ZS2
MARKET REEF	OJ0
MARQUESAS ISLAND	FO8
MARSHALL ISLAND	KX6
MARTIM VAS ISLAND	PY0
MARTINIQUE	FM
MAURITANIA	5T
MAURITIUS ISLAND	3B8
MAYOTTE	FH
MEXICO	XE
MIDWAY ISLAND	KH4
MINAMI TORI SHIMA	JD1
MINERVA REEF	A3
MIQUELON ISLAND	FP
MOLDAVIA	UO
MONACO	3A
MONGOLIA	JT
MONTSERRAT	VP2M
MOROCCO	CN
MOUNT ATHOS	SY
MOZAMBIQUE	C9
NAMIBIA	ZS3
NAURU	C2
NAVASSA ISLAND	KP1
NEPAL	9N1
NETHERLANDS	PA
NETHERLANDS ANTILLES	PJ
NEVIS ISLAND	V47
NEW CALEDONIA	FK
NEW HERBRIDES	YJ
NEW ZEALAND	ZL
NEWFOUNDLAND	VO1
NICARAGUA	YN
NICOBAR ISLAND	VU4
NIGER	5U
NIGERIA	5N
NIUE ISLAND	ZK2
NORFOLK ISLAND	VK9N
NORTH KOREA	P5
NORTH YEMEN	4W
NORTHERN IRELAND	GI
NORWAY	LA
OGASAWARA ISLAND	JD1
OKINO TORI SHIMA	7J
OMAN	A4
PAKISTAN	AP
PALMYRA ISLAND	KH5
PANAMA	HP
PANTELLERIA ISLAND	1H
PAPUA NEW GUINEA	P2
PARACEL ISLANDS	BY
PARAGUAY	ZP
PERU	OA
PETER 1ST ISLAND	3Y
PHILIPPINES	DU
PHOENIX	T32
PITCAIRN ISLAND	VR6
POLAND	SP
PONZIANI ISLAND	IB0
PORTUGAL	CT
PRINCE EDWARD ISLAND	VE1
PRINCE EDWARD ISLAND	ZS2
PRINCIPE	S9
PRIBILOF	KL7
PROVIDENCIA ISLAND	HK0
PUERTO RICO	KP4
QATAR	A7
RAPA ISLAND	FO8
REPUBLIC OF CISKEI	S8
REUNION ISLAND	FR
REVILLA GIGEDO ISLAND	XF4
RIO DE ORO	EA9
ROCKALL ISLAND	GM
RODRIGUEZ ISLAND	3B9
ROMANIA	YO
RONACDOR CAY	HK0
ROTA ISLAND	KH0
ROTUMA ISLAND	3D2
RUSSIA-SIBERIA	UA9–0
RUSSIAN S.F.S.R.	UA
RUSSIAN-URAL MT	UA9–0
RWANDA	9X
RYUKYU ISLAND	JR6
SABA ISLAND	PJ
SABAH	9M6
SABLE ISLAND	VE1
SAIPAN	KH0
SAKHALIN ISLAND	UA9–0
SAN ANDRES ISLAND	HK0
SAN FELIX ISLAND	CE0X
SAN MARINO	T7
SAO TOME	S9
SARAWAK	9M8
SARDINIA	IS
SAUDIA ARABIA	HZ
SCOTLAND	GM
SENEGAL	6W
SERRANA BANK	HK0
SEYCHELLES	S79
SICILY	IT9
SIERRA LEONE	9L
SINGAPORE	9V
SINT EUSTATIUS	PJ
SINT MAARTEN ISLAND	PJ
SMOM	1A
SOCIETY ISLAND	FO6
SOCOTRL ISLAND	7O
SOLOMON ISLANDS	H44
SOMALI REPUBLIC	T5
SOUTH AFRICA	ZS
SOUTH GEORGIA ISLAND	VP8
SOUTH ORKNEY ISLAND	VP8
SOUTH SANDWICH ISLAND	VP8
SOUTH SHETLAND ISLAND	VP8
SOUTH YEMEN	7O
SPAIN	EA
SPRATLY ISLAND	1S
SRI LANKA	4S
ST BRANDON ISLAND	3B7
ST HELENA ISLAND	ZD7
ST KITTS	V44
ST LUCIA	J6
ST MARTIN ISLAND	FS
ST PAUL ISLAND	FT8
ST PETER AND PAUL ROCKS	PY0
ST PIERRE ISLAND	FP8
ST VINCENT	J8
SUDAN	ST
SUMATRA	YB
SURINAM	PZ
SVALBARD ISLAND	JW
SWAN ISLAND	HR0
SWAZILAND	3D6
SWEDEN	SM
SWITZERLAND	HB
SYRIA	YK
TADZHIK	UJ
TAIWAN	BV
TANZANIA	5H3
TASMANIA	VK7
THAILAND	HS
TINIAN	KH0
TOGO	5V
TOKELAU	ZM7
TONGA ISLAND	A3
TRANSKEI	S8
TRANSVAAL	T4
TRINIDADE ISLAND	PY0
TRINIDAD AND TOBAGO	9Y
TRISTAN DA CUNHA	ZD9
TROMELIN ISLAND	FR/T
TUAMOTU ARCHIPELAGO	FO8
TUBUAI	FO8
TUNISIA	3V
TURKEY	TA
TURKMEN	UH
TURKS AND CAICOS ISLANDS	VP5
TUSCAN ARCHIPELAGO	1A
TUTUILA ISLAND	KH8
TUVALU	T2
UGANDA	5X
UKRAINE	UB,UT,UY
UNITED ARAB EMIRATES	A6
UNITED NATIONS-NEW YORK	4U1UN
UNITED NATIONS-GENEVA	4U1TU
UNITED NATIONS-VIENNA	4U1VIC
UNITED STATES	W,K,N,A
URUGUAY	CX
USTICA ISLAND	IE9
UZBEK	UI
VANUATU	YJ
VATICAN CITY	HV
VENEZUELA	YV
VIETNAM	3W
VIRGIN ISLANDS	KP2
WAKE ISLAND	KH9
WALES	GW
WALLIS ISLAND	FW
WALVIS BAY	ZS8
WAYNE GREEN	W2NSD
WEST CAROLINE ISLAND	KC6
WEST GERMANY	DL
WEST KIRIBATI	T3
WESTERN SAMOA	5W1
WESTERN SAHARA	S0
WILLIS ISLAND	VK9Z
WORLD BANK	4U2
YEMEN	4W
YUGOSLAVIA	YU
YUKON	VY1
ZAIRE	9Q
ZAMBIA	9J
ZANZIBAR	5H1
ZIMBABWE	Z21

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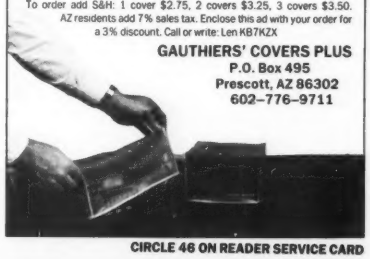

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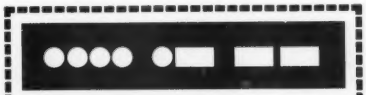

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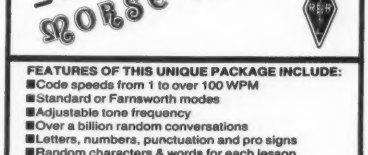

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This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

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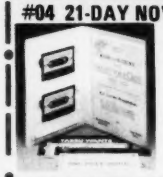

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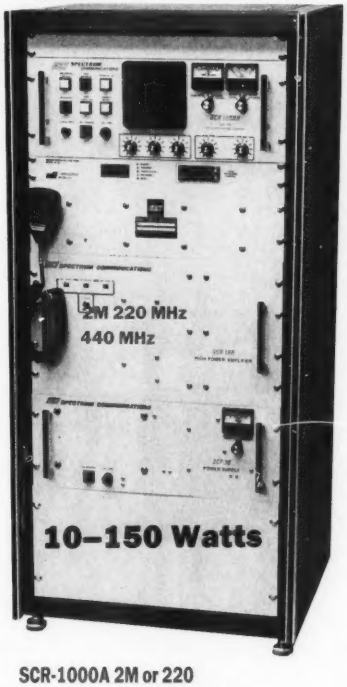

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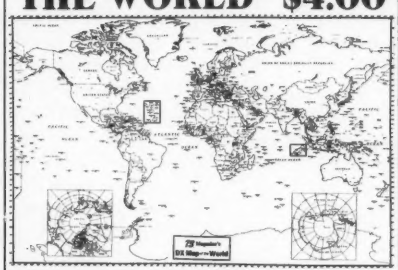

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RANDOM OUTPUT

David Cassidy N1GPH

I've been writing the back page column the last couple of months since Jim Morrissett K6MH moved back to California. Now it's my great pleasure to introduce our new Associate Publisher, David Cassidy N1GPH, who'll be writing this column from now on. David has some great ideas to revitalize amateur radio. With David's guidance and enthusiasm you can expect to see even more of the latest and greatest in the upcoming issues of 73. Take it away, David. . . de WB8ELK

David Who?

Let's get the issue of my name out of the way right at the start, shall we? Yes, my name really is David Cassidy. No, I did not star in a TV sitcom in the 1970s. Yes, I have heard every joke you could possibly think of. 'Nuff said.

Not Just a Job . . .

I have been a ham for about 17 years. I recently joined the team here at Wayne Green Enterprises to work on some of the other projects Wayne has cooked up. He and I got to talking about amateur radio, *73 Magazine* (which I've read for most of the last 17 years) and the current state of the industry. I guess I stated my opinion a little too strenuously, because the end result of that conversation is that I'm sitting in my bed on a Sunday night, with a very expensive laptop computer in front of me, writing this column—instead of sleeping in blissful ignorance of such things as deadlines, page yields, budgets and the million and one other things Wayne pays me to worry about (I was never in the army, so nobody ever warned me about volunteering).

Still, this job IS as much fun as you think it is. Just this week I have tested two new antennas, assisted WB8ELK in launching a balloon carrying 2 meter voice and 70 cm ATV beacons (keep an eye on Bill's column for a report on this—about 70 hams all over the East Coast had a ball tracking this thing!), made reservations to travel to a West Coast hamfest, read countless interesting articles submitted for publication, had numerous packet QSOs with my Dad (WB1DSL) and my brother (N1HLR), played with more computer stuff than most folks see in a year, helped the *73* ad reps get five new pages of advertising, sat around and listened to Wayne's great stories, picked out all the neat stuff we're going to review from the stacks of new product announcements the manufacturers send us, arranged to have a new HF rig shipped to us, talked with my buddies N1GVA, N1GOJ and KA1UNW on 40 meter CW, blew up my old HW-101 (again), got my old Drake TR-4C working (again) and made some exciting plans for our 30th anniversary year. All this, in addition to the actual "work" part of my job. Thanks, Wayne! Now, about that new mobile rig we talked about. . . .

What's Happ'nin'?

With the recent juggling of personnel here, you're probably asking yourself, "What's going to happen to *73*?" Well, nothing. . . and everything. We start our 30th year of publication with the October issue. To celebrate, we're redesigning the logo a bit, changing the name slightly (does anyone know how many different names this magazine has had in the last 30 years?), and planning a whole year of special events. Thirty years of anything is reason enough to celebrate, but we DO have an ulterior motive. We here at *73* are going to take a leadership role in revitalizing amateur radio.

Sure, we're still going to scream long and loud about the problems (and try to get you off your butts, away from your TV, and DOING something about it), but we also have a responsibility to lead the charge. If the ARRL is too busy patting themselves on the back, spending our money on trips to Arizona and forcing the FCC one step closer to dumping the whole Amateur Radio Service, then we—that's me and you—are going to have to do it. Let's remember how much fun amateur radio can be.

This column will never be the same from month to month. I might report on some hams doing great public relations work or running a successful licensing class, or I might rant and rave about some jerk who walked all over my 40 meter QSO (see below). I hope that at least I will be able to get some of you to start thinking. . . and acting.

If you have anything happening in your neck of the woods, let me know. Write to me here, or use the *73* BBS, or send some packet mail to me (N1GPH @ WA1WOK.NH). Whatever you've got to say, say it. Something going on that you don't like? Tell me. Even more important, let me know about the triumphs, big and small.

Back to School

As the summer vacation season winds down, we find the beginning of the school year approaching. Most kids are grumbling about having to trudge back to the classroom, but the students of Intermediate School 72 in Staten Island, New York, usually can't wait for classes to start. As long as it's Carole Perry's "Introduction to Ham Radio" class, that is.

It's with great pleasure that we welcome Carole Perry WB2MGP ("Mighty Good Professor") to our lineup of *73* columnists. If more teachers had her enthusiasm and willingness to promote amateur radio in the classroom, we'd have the largest increase of new hams in amateur radio history! Carole hopes to use the new column—"Hams with Class"—to help educate the public about amateur radio and promote it in a big way. Welcome, Carole. . . we're glad (and lucky) to have you on the team!

A Personal Message to W1AW

On July 9, 0130 UTC (that's 9:30 p.m. EDST on July 8, in case you can't remember how to convert UTC), your automatic bulletin on 40 meters came in on the exact frequency where I was in QSO with another New England station. I want to remind you that transmitting without first checking to see if the frequency is in use is a violation of FCC regulations (97.101, subpart B), and repeated offenses could result in suspension or revocation of operating privileges and confiscation of all transmitting equipment.

I left a message on your answering machine, but I guess you guys are too busy, planning all those trips and new offices and everything, to give me the courtesy of a reply (don't bother with an explanation—there is none).

Just a friendly reminder.

Number 41 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

The Best of the '90s

Probably the next-best conditions of 1990 will occur this month, in September. When September is over, compare it with March, as March may prove to have been the best month of all.

The equinox occurs on September 22. DX ought to last on the higher bands, 10–20 meters, until after dark on most days. You can also expect grayline DXing along the path of the terminator at the appropriate times of sunset and sunrise.

The worst conditions of the month will most likely be centered around the weekend of the 15th and 16th, but otherwise you can expect fair to good conditions on most days. During these times of very high solar activity, possible flares and solar upsets can occur at almost any time, so the chart only gives those days during which disturbed magnetic field conditions are most likely.

Old Sol is at his least predictable right now, so keep a sharp ear tuned to WWV at 18 minutes after each hour for the most recent updates on solar/terrestrial events. Full moon occurs on the 5th, and no eclipse of either sun or moon are happening this month.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	7/21
ARGENTINA	15	7/28	20	40	40	—	—	10	—	—	7/21	7/21
AUSTRALIA	7/21	20	20	20	20	40	7/28	20	—	—	—	7/21
CANAL ZONE	15	7/28	7/28	7/28	7/28	15	15	10	10	10	20	10
ENGLAND	20	40	7/28	7/28	40	—	—	15	10	15	15	20
HAWAII	7/21	15	20	20	7/28	7/28	20	20	—	—	—	7/21
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	7/21
MEXICO	15	7/28	7/28	7/28	7/28	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	7/21	10	—	—	15
PUERTO RICO	15	7/28	7/28	7/28	7/28	15	15	10	10	10	20	10
SOUTH AFRICA	7/28	40	20	20	—	—	—	—	—	10	10	15
U.S.S.R.	40	7/28	20	20	—	—	—	7/21	7/21	—	20	20
WEST COAST	7/28	7/28	7/28	40	40	—	—	7/21	7/21	7/21	7/21	20

CENTRAL UNITED STATES TO:

ALASKA	7/21	15	20	20	20	—	20	20	—	—	—	7/21
ARGENTINA	15	15	7/28	7/28	20	—	—	10	—	—	10	7/21
AUSTRALIA	7/21	15	15	—	20	7/28	40	20	—	—	15	10
CANAL ZONE	7/28	7/28	7/28	7/28	7/28	—	—	—	7/28	7/28	10	10
ENGLAND	40	7/28	40	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	20	20	7/28	40	20	—	—	10	10
INDIA	15	7/28	—	—	—	—	—	7/28	15	—	—	—
JAPAN	7/21	15	20	20	20	—	20	20	—	—	—	7/21
MEXICO	7/28	7/28	7/28	7/28	7/28	—	—	7/28	7/28	10	10	10
PHILIPPINES	7/21	—	20	20	—	—	—	—	7/21	7/21	—	—
PUERTO RICO	7/28	7/28	7/28	7/28	7/28	—	—	7/28	7/28	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	7/28	20
U.S.S.R.	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

ALASKA	7/21	7/21	15	20	20	20	—	20	20	—	—	15
ARGENTINA	7/21	15	15	20	20	—	—	—	—	—	—	10
AUSTRALIA	10	7/21	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	7/28	7/28	7/28	—	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	7/28	20
HAWAII	7/21	7/21	15	7/28	7/28	7/28	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	7/28	15	—	—
JAPAN	7/21	7/21	15	20	20	20	20	—	20	—	—	15
MEXICO	10	15	7/28	7/28	7/28	—	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	7/28	—	—
PUERTO RICO	10	15	7/28	7/28	7/28	—	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U.S.S.R.	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	7/28	7/28	7/28	40	40	—	—	7/21	7/21	7/21	7/21	20

Notes: 1. The numbers usually indicate the highest usable frequency band. Where two bands are listed (20/40, for example), both could well work on that path at that time. 2. Always look at the next highest band as well for any listing. 3. For WARC bands, use 10 for 12, 15 for 17, and 40 for 30 meters.

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F
2 F-G	3 G	4 G	5 G	6 G	7 G	8 G-F
9 F-G	10 G	11 G	12 G-F	13 F	14 F-P	15 P
16 P	17 P	18 P-F	19 F-G	20 G	21 G	22 G-F
23 F	24 F-G	25 G	26 G	27 G-F	28 F	29 F-G
30 G						

Remotely Unique.

First and only detachable remote control panel all-mode HF radio.

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on all Amateur Radio Products

The Yaesu FT-747GX packs more features you want into a size you can handle—on the road or at home.

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While the detached transceiver can be installed anywhere—in the trunk or under the seat.

Trust Yaesu to give you the best—powerful transceivers delivering clear communications and trouble-free operation for years to come.

The FT-747GX was made for you. Check these features:

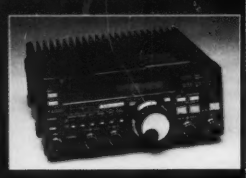
- General coverage: continuous reception from 100 kHz to 30 MHz.
- Ergonomic design includes front panel mounted loudspeaker and unobstructed display/control layout.
- Easy one-touch dual VFO control to select a favorite frequency or operate split with minimum effort.
- 20 memory channels store mode and skip-scan status for auto resume scanning of selectable memories. Up to 18 memories can store independent TX and RX frequencies—great for split frequency combinations!
- 100 watts of PEP output on all HF amateur bands.
- Compact and lightweight SSB, CW, AM and FM (optional) transceiver.

Standard model shown.

Optional remote kit RMK-747 shown.

If the FT-747GX or FT-757GX II sounds like the transceiver you've been looking for, contact the Yaesu dealer nearest you.

FT-757GX II: All mode transceiver



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TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family – the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!

- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)

- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

Optional accessories:
- **BC-14:** Wall charger for PB-13
- **BC-15:** Rapid charger for PB-13, 14
- **BC-16:** Wall charger for PB-14
- **BH-6:** Swivel mount
- **BT-8:** Six cell AA Alkaline battery case
- **HMC-2:** Headset with VOX and PTT
- **PB-13:** 7.2 V, 700 mAh NiCd pack
- **PB-14:** 12 V, 300 mAh NiCd pack
- **PG-3F:** DC cable with filter and cigarette lighter plug
- **PG-2W:** DC cable
- **SC-31:** Soft case
- **SMC-31:** Standard speaker mic
- **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water resistant bag.

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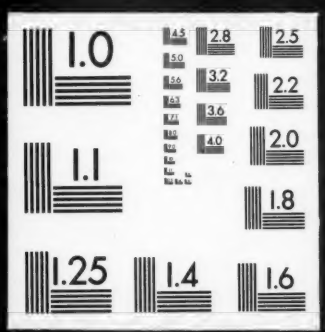
Complete service manuals are available for all Kenwood transceivers and most accessories.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